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- Random number generator function
- Many usable, sample programs included
- UniFLEX version supports:
 - Random file positioning
 - All various UniFLEX system routines
 - UniFLEX utility commands
- UniFLEX is available

EX
uffered or sing
Standard math functions
SQR, SQRT
Random number generator function
• Many usable, sample programs included
• UniFLEX version supports:
 Random file positioning
 Ability to call various UniFLEX system routines
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- UniFLEX version supports:
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FOREIGN

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Items Submitted for Publication

Articles submitted for publication should be accompanied by the authors full name, address, date and telephone number. It is preferred that articles be submitted on either 5 or 8 inch diskette in TSC Editor format or STYLO format. All diskettes will be returned.

The following TSC Text Processor commands ONLY should be used (due to our proportional processor): .sp space, .pp paragraph, .fl fill and .nf no fill. Also please do not format within the text with multiple spaces. The rest we will enter at time of editing.

STYLO commands are all acceptable except the .pg page command, we print edited text files in continuous text.

All articles submitted on diskettes should be in TSC FLEX" format, either FLEX2 6800, or FLEX9 6809 any version.

If articles are submitted on paper they should be on white 8X11 bond or better grade paper. No hand written articles (hand written or drawn art accepted). All paper submitted articles will be photo reproduced. This requires that they be typed or produced with a dark ribbon (no blue), single spaced and type font no smaller than 'elite' or 12 pitch. Typed text should be approximately 7 inches wide (will be reduced to column width of 3 1/2 inches). Please use a dark ribbon!

All letters to the editor should also comply with the above and bear a signature. Letters of 'gripes' as well as 'praise' are solicited. We attempt to publish all letters to the editor verbatim, however, we reserve the right to reject any submission for lack of 'good taste'. We reserve the right to define what constitutes 'good taste'.

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Build performance into your system

with OS-9™ software tools

Unix®-based, multitasking, modular and versatile: these key features are some of the reasons why more 6809 computer manufacturers have selected OS-9 as their standard operating system than any other. And OS-9 has been put to work by thousands of users in almost every conceivable computer application in business, science, industry, education, and government.

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There are two basic versions of OS-9. Both have the same basic features and capabilities. OS-9 Level One runs on small to medium sized systems having up to 64K memory. The Level Two version runs on medium to large size systems having memory management hardware and up to 1 megabyte of memory, and includes record and file locking for multiuser database applications.

Here are just a few reasons why you should insist on OS-9 for your microcomputer system.

Over 40 utility commands
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OS-9 PASCAL Language Compiler

most complete and versatile PASCAL available for the 6809 capable of generating P-code for interpretive execution while debugging OR highly optimized 6809 assembly language source code output for maximum speed
"virtual memory" P-code interpreter lets you run large PASCAL programs

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ideal for most demanding business applications features ISAM, Debug, ACCEPT/DISPLAY and Interprogram Communications modules retains full compatibility with CP/M software meets ANSI 1974 Level One COBOL standard and is GSA certified Also available-FORMS 2 automatic program generator for easy interactive design of screen oriented applications.

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fastest and most comprehensive full Basic language available for the 6809 combines standard Basic with the best features of PASCAL features compiler speed, interpreter friendliness and superlative debugging facilities option available: Run B...a ROMable run-time system for compiled Basic 09

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For more information contact your computer supplier or



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Expand your 6809 computer to a fast, efficient multi-user system utilizing up to one megabyte of memory, almost any I/O device, and comprehensive implementations of the most-wanted programming languages: Basic09^{**}, C, Pascal, Cobol, and Assembler.

With OS-9^{**} Level Two, your computer is transformed into the ultimate software development system with performance and features found only on large and costly computing systems. It brings to your fingertips the friendliness and power of a Unix[†]-style environment.

As a multi-user system...

OS-9 Level Two excels with a multi-level directory system, a fast random access file system with record lockout, user name/password logon protection, "pipes" for interprogram communication, and full file security. The versatile "Shell" command interpreter makes it easy for each user to run interactive or multiple background programs with I/O redirection to or from any file or I/O device.

As a real-time system...

Your OS-9 based computer can sense, monitor, control, and communicate with the real world thanks to OS-9's highly modular and user expandable structure. Adding customized I/O to OS-9 is almost too easy: software interfaces are simple, modular, and well documented. That is why OS-9 users routinely interface it to almost every kind of peripheral device and instrumentation.



For large systems...

OS-9 Level Two can handle over one megabyte of RAM and ROM memory with extraordinary efficiency. When, as is often the case, two or more tasks run the same program (such as Basic09) they automatically "share" just one copy in memory. Also, OS-9 Level Two typically resides in less than 24K memory. Savings like these give OS-9 based systems large capacity without having to resort to performance-robbing techniques such as disk swapping.

OS-9 Level Two is available exclusively from manufacturers of most popular 6809 computers equipped with memory management hardware. They offer versions specifically tailored to their computers for use with both new and existing systems.

For more information about OS-9 Level Two contact your computer supplier, or



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DynaStar WORD PROCESSING SYSTEM FOR OS-9

OS-9 USERS:

If your computer has a SCREEN and you're still struggling with an editor that only knows about LINES, then obviously YOU don't know about!

DynaStar

DynaStar is a powerful, menu-driven screen editor equally suited to the tasks of program preparation and document processing. With the addition of the optional DynaForm print formatter, it is the best word-processing package you can buy for your OS-9 system.

DynaStar Version II is now available and features no-nonsense "what you see is what you get" editing for virtually any terminal with or without cursor addressing (it must be at least able to go to "home"). To edit, simply place the cursor where you want it, and type. Any printable character you type is entered directly into your text, and any non-printable control character causes immediate execution of an editing command. Single key stroke commands permit movement of the cursor in any direction, by character, tab, word, line, or screen full, and deletion of characters, words (left or right) or a whole line. Two keystroke commands augment this set by moving the cursor to the left margin, top or bottom of the screen, beginning or end of the edit buffer, or the beginning of the next paragraph. You can search for any string, replace with any other, do it again, mark original blocks of text, copy, move or delete blocks, read or write to side-files, set tabs and margins, or center the current line.

A/BASIC Basic Compiler

For OS-9 or FLEX

If you are still programming in assembler, this is the program for you! This BASIC compiler generates pure, fast efficient 6809 machine code from easy to write BASIC source programs. Uses ultra-fast integer math, extended string functions, boolean operators and run-time operations. Output is ROMable and RUNS WITHOUT ANY RUN-TIME PACKAGE. Supports IF-THEN-ELSE structure, random access, and several improvements over the original 6800 version sold by Microware. Optimized for the 6809, A/BASIC is 8 to 10 times faster than the original 6800 version, and produces code approximately 30% smaller.

SPECIAL

CHESS program coded in A/BASIC (originally sold for \$50) is included FREE on the disk in both source and object for your enjoyment. Also some utilities are included for testing and examples, all in source on the disk!

ONLY \$150.00

specify OS-9 or FLEX

PLOT

Now you can have GRAPHICS added to all your programs. Just write the data out to a virtual array and call PLOT. PLOT is written in TSC XBASIC and the source is included on the disk.

INFINITE RESOLUTION GRAPHICS ON YOUR TERMINAL OR PRINTER. HISTOGRAMS, BAROGRAPHS, XY PLOTS PLUS OTHERS. IN TSC XBASIC. SOURCE INCLUDED ON DISK. \$44.95

DynaStar features automatic word wrap and it can right-justify text as you enter it so you will see exactly how it will look before you print it. If you later make alterations or change the margins, you can reformat the text a paragraph at a time with two keystrokes. For programmers, there is a special automatic indent mode to help you write well-structured code. DynaStar includes a Shell command which lets you do almost anything (including edit another file) without even losing your place in your current document, and it permits editing of large disk files in stages without forcing you to break up your files.

If you want to define more powerful commands, DynaStar includes a macro facility which lets you convert any special character to one or a string of characters of your choice. You can use this feature to create global search-and-replace commands, insert "hot keys", or simply re-map your keyboard. You can also provide a special "startup" string which is automatically executed whenever you enter the editor to set up modes such as auto-justify, display a directory, define your favorite macros, or re-map the keyboard.

For complete word processing, we offer our DynaForm text formatter which provides all the standard features such as pagination, headers and footers with page numbers, single space, double space, multiple space, bold face, double strike, and underline. DynaForm has its own macro facility with string variables, nested include files, a full merge/print capability for generating form letters and mailing lists, and it can generate an index automatically, sorted alphabetically or by page number. You can call it from DynaStar to proof-print the active edit buffer, or by itself to print a disk file while you edit another.

DynaStar II \$149.95
DynaForm text formatter \$149.95
Both purchased together \$275.00
Note: DynaStar Version I (no macros) will be available at the original price until May 31, and current owners may upgrade to Version II with full credit until June 30.

AVAILABLE SOON FOR FLEX 9

Spelltest

From Dale Puckett

FOR OS-9 OR FLEX

SPELLTEST is the most versatile 68XX spelling checker available. MENUS MAKE IT EASY. From the menu you may: Print a words, text, dictionary, application, etc. While creating an spelling, Design at home in the cost 22,000 words in the America English word 500 built in common words, etc. and 300 specific to your field. It allows a large file to be processed even in small computers.

PRICE \$199.00

TOOLKIT NO1

The Basic Programmers Toolkit
by Dick Bartholomew

The Basic Programmers Toolkit gives the BASIC programmer the power and flexibility never before achieved under FLEX.

PRICE \$49.95 object only
\$69.95 with source on disk!

TOOLKIT NO2

The Programmers Toolkit
by Dick Bartholomew

The Programmers Toolkit is a package of utilities and programs that extend the capabilities of FLEX to the utmost.

PRICE \$49.95 object only
\$69.95 with source on disk!

Dynasoft RAVVIV 1.4 for OS-9

Dynasoft Pascal Version 1.5 Now Available 40% Faster
Features of the enhancements. Close, Delete, Insert, Gelstatus, This is an excellent and fast program. It is write utilities
Integer Only. Object only \$69.95 Add for run-time source on disk \$30.00 Add for source of Dynasoft Pascal itself \$125.00

CRASMB

MULTI CPU CROSS ASSEMBLER FOR 6809
FLEX OR OS-9
by Frank Hollman

CRASMB is a conditional macro assembler with the capability to use different CPU overlays in order to cross assemble. These CPU overlays called CPU PERSONALITY MODULES (CPM's) can be called from a source file, thereby making it easy to create object code for a variety of CPU's. It is also possible to create new CPM's yourself for any 8 or 16 bit CPU. The information needed is included in the manual. If you decide to do this, it would be advisable to purchase the source for one of the CPM's and modify it rather than starting from scratch. CPM's are currently available for the following CPU's: 6809, 6800, 6805, 6502, 280, 8080, 1802, and others coming.

FLEX 139.95 with any CPM OS-9 200.00 with 6809 CPM CPM's 25.00 each 35.00 each CPM source 25.00 each 35.00 each

Specify FLEX or OS-9 when ordering

THE BILL PAYER SYSTEM™

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INCOME/EXPENSE LEDGER. This valuable package is most appreciated after taxes. Allows up to 99 income and expense numbers. Ties into the PURCHASE ORDER system and the Bill Payer. Includes manual and source supplied on disk in TSC Extended Basic.

THE BILL PAYER
PURCHASE ORDER
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611-636-6260

COLOR COMPUTER USERS

FHL COLOR FLEX, THE MOST POPULAR DOS FOR THE 6809 FROM THE LARGEST SUPPLIER OF FLEX SOFTWARE IN THE WORLD!

Now you can run FLEX, OS-9 and Radio Shack disk software on your Color Computer. If you have a 32K Color Computer with the Radio Shack disk system, all you need to do is make a trivial modification to access the hidden 32K, as described in the Feb. issue of COLOR COMPUTER NEWS and the April issue of 68 Micro. You can get FLEX from us right now. OS-9 will be ready by summer. Please note that this will only work with the Radio Shack disk system and 32KB/64KB memory chips that RS calls 32K. Maybe they put 64K's in yours, too. If you don't have a copy of the article, send a legal size SASE (40¢ stamp) and we'll send it to you.

Using this system to run FLEX AND OS-9 has many advantages. First, it gives you 64K from zero right up to FLEX. This means that ALL FLEX compatible software will run with NO MODIFICATIONS AND NO PATCHES! There are no memory conflicts because we moved the screen up above FLEX which leaves the lower 48K free for user programs.

What you end up with is 48K for user programs, 8K for FLEX and another 8K above FLEX for the screen and stuff. We have a multi screen format so you can page back and forth to see what's scrolled by. A Hi-Res screen that will enable you to have a 24-line by 51 character display. That's better than an Apple!

We also implemented a full function keyboard, with a control key and escape key. All ASCII codes can now be generated from the Color Computer keyboard!

We also added some bells and whistles to Radio Shack's Disk system when you're running FLEX or OS-9. We are supporting single or double sided, single or double density, 35, 40 and 80 track drives.

MOVEFROM moves Color Basic from ROM to RAM. Because it's moved to RAM you can now directly access it from FLEX. You can run it and even change it! You can load Color Computer cassette software and save it to FLEX disk. Single Drive Copy, Format and Setup commands plus an online help system are included.

Color FLEX includes an external terminal program that lets you use a standard terminal hooked to the RS-232 port. This will let you use a full sized keyboard with a 24x80 display. Your printer is then hooked to the terminal. The system will automatically control the printer. No hardware or software modifications are required.

Installing FLEX is simple. Insert the disk and type

RUN "FLEX"

That's all there is to it! You are now up and running in the most popular disk operating system for the 6809. There are hundreds of software packages now running under the FLEX system. We have 100 packages ourselves. Open your Color Computer to a whole new world of software with FLEX.

FLEX OS-9
INCLUDES OVER 25 UTILITIES!
DOES NOT REQUIRE ADDITIONAL HARDWARE!

OPTIONS

ED/ASM is a very powerful editor/Assembler package. ED has all the features of TSC's editor with the addition of screen type editing, MACRO capability, and a math package. With the math package you can perform simple or complex formulas with the answer in HEX.

OSM

OS-9/FLEX MACRO ASSEMBLER
by Frank Holloman

For FLEX or OS-9. Create FLEX or OS-9 binary files from either FLEX or OS-9. OSM is a MACRO assembler like CRASMB. It is compatible with TSC's Assembler, but it has more powerful MACROS. OSM makes it easy to move FLEX programs to OS-9. In OS-9 it gives MACRO capability like TSC's as-sembler and is compatible with TSC source files. OSM was used by the author to move CRASMB to OS-9.

PRICE \$125.00
Specify OS-9 or FLEX

AUTOTASK

WITH MENU

PRICE \$120.00

Includes source on disk!
Manual \$10.00

6502 TRANSLATOR
Translator 6502 code to 6809
\$75.00

SUPER SLEUTH
Disassembler for 6800/6809 or Z80
\$99.00

We Have
DynaCalc
For Flex
\$200.00

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CRASMB OS 9	200.00	9
Personality Modules	35.00	35.00
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Flex User Notes

Ronald W. Anderson
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MATH AGAIN

I promised that we would look at addition and subtraction this month, and I've done the routine to do both, since subtraction may be done with a complement and add procedure that involves only one extra step. Perhaps we had better review binary two's complement numbers just a bit. Let's consider 8 bit numbers for illustrative purposes. A signed 8 bit number may have a value between -128 and +127. You may remember that the negative of a number is obtained by complementing the number and adding 1. Complementing simply means changing all the 0's to 1's and vice versa. For example, 7 would be represented as:

00000111

complementing:

11111000

add 1

11111001

The result is the representation of -7. -1 is represented by 11111111. You will note that the leftmost bit of all negative numbers is a 1 and the leftmost bit of all positive numbers is a 0. That bit, is therefore called the sign bit. Now, the 68XX has an instruction called NEG for negate, which does the complement and add 1 operation. There is, however, one problem. There is no NEGD operation, only a NEGA or NEGB (or NEG <memory location>). All these are single byte operations. In order to negate the contents of D, you must use a sequence of instructions.

COMB
COMA
ADDD #1

In other words, the 16 bit instruction is missing. Of course, three instructions are not all that difficult to put together. To add two numbers input as sign and magnitude, we simply convert negative numbers to their two's complement form by the above three instructions, and add them. The whole operation is done in the program ADDSUB. There are several ways to add two 16 bit numbers. One of the sneakiest is to use a register offset instruction.

LOX ARG1
LDD ARG2 ARG3 ALREADY CONVERTED TO TWO'S COMPLEMENT
LEAX D,X

That is a very brief, and fast way to add two numbers. However, it is difficult to test for overflow, since LEAX doesn't change any but the zero flag. Assuming that the add routine is passed the two arguments on the User stack, a better routine would be, assuming the arguments are passed as two's complement numbers and the results are returned in the same way:

ADD LDD 0,U
ADDD 2,U
BVS OFLOW
LEAU 4,U REMOVE ARG3 FROM STACK
PSHU D PUT RESULT ON STACK
RTS
ERROR LOX #ERMSG
JSR PSTRNG
JMP WARMS EXIT ON ERROR

The overflow flag indicates an overflow on signed arithmetic. The faster method works fine if you can guarantee that all arguments will be within the proper range so that overflow cannot occur, or if for some reason, it is understood that overflow is acceptable.

For subtraction, you use the old rule of Algebra, change the sign and add. That is, the number to be subtracted, which is in two's complement form, is negated and the two arguments are added. In the case of the above routine, we would simply insert the following above ADD.

```
SUH LDW 2,U
BSR NEGATE
STD 2,U

ADD etc.

NEGATE COMB
COMA
ADDD #1
RTS.
```

The listing for ADDSUB should tie all this together for you. Next time, we will go about putting together the multiply, add, and subtract routines as a group of subroutines, and run them with a small executive program that will get the arguments and operation and perform it.

LANGUAGES

I recently received a letter from Bob Nay at '68' Micro Journal, indicating that he thinks it would be a good idea for me to write a comparison or analysis of the various languages that are available for our SS-50 FLEX09 systems. I reminded Bob that I had done that about a year ago, but perhaps since the coming of the color computer, I should repeat that analysis from my present viewpoint a year or more later. I've "grown" as a programmer in that time, having taken part in the writing of the largest program I have ever been near, this past year and a half or so.

At least one reader of my last effort along this line, wrote to say that I had been unbiased in my presentation. I hope I can do as well this time. We ought to look at FORTH, BASIC, Pascal, "C", and Assembler, and compare the virtues of each. Of course, my personal preferences will show, but I will try to be objective. First of all, it ought to be said that the various high level languages were all designed for different purposes. I will mention the designer's purpose in the discussion of each language.

FORTH

FORTH was designed by an Astronomer in an effort to create a very compact language so that programming might be done quickly. Those objectives were certainly met. FORTH is a language all by itself. There's nothing quite like it. I've read with interest nearly everything others have had to say about it, and they have influenced my thinking somewhat. First of all, FORTH, like all the other high level languages, is system or computer independent. FORTH, in fact, is a little more uniform from one computer to another, because it also provides the operating system. The basic unit of memory in FORTH is a SCREEN. A SCREEN is a work area of 16 lines of 64 characters each. All numerical and logical operations in FORTH are done by means of a STACK. You put "arguments" on the stack, and then perform the operations. If you have ever used a Hewlett Packard calculator, you know about "Reverse Polish" notation. You don't enter $2 + 3 =$ to add those numbers, but instead, $2 \text{ ENTER } 3 +$. While you may think that to be backwards, isn't that how you do it with a pencil and paper? You write "2", then you write "3", then you draw a line, and add. Not really so different, is it?

Since my first Hewlett Packard calculator, I have been a fan of reverse polish notation. In FORTH, you would enter the variables "2 3 + ." The "." means "output the result" (equivalent to PRINT in BASIC). All arguments in a FORTH program are separated by spaces. You write a program in FORTH by defining words. ":" is a word that causes the addition of the two top numbers on the stack. Entering a number, places it on the stack. ":" pulls the two top numbers from the stack, adds them and places the result back there. You could define a word that multiplies a value by 2. You define a word by writing a "colon definition".

: 2TIMES 2 * . ; The word just defined is "2TIMES", that is, the first argument in the definition is the name of the word being defined.

The definition is started with a colon and ended with a semicolon. Now if you had FORTH running and you entered "7 2TIMES" (return) you would get "14 OK". The "OK" means that FORTH has done what you asked and is waiting for another command. You defined a word that multiplies the top number on the stack by 2 and outputs it. By means of building new words, you can quickly build a rather complex program. Words must be defined before they may be used or referenced. In my opinion, FORTH programs are rather cryptic in appearance, and are difficult to read so that one programmer may not easily follow another programmer's program. Perhaps that is because a programmer really "invents" his own programming language as he goes. (see example below)

One of the reasons (for me) for not liking FORTH particularly, is that there are about 100 "words" in the basic vocabulary that you must "learn" before you can become proficient in FORTH. In my opinion, FORTH is rather "Irregular". That is, related words do rather arbitrary things. (I have by now insured that I will receive 17 irate letters from FORTH fans.) It has been said that you either LOVE FORTH or you HATE it. I guess I am not in either category. I've grown proficient enough in it to be able to use it reasonably. I don't see the fantastic advantage of using it, over other high level languages that is claimed by the FORTH enthusiasts.

FORTH has a place in the list of programming languages. If you are doing some sort of process control, data collection, etc. and no one else has to read your code, you might find FORTH the most efficient language to use. It is almost as interactive as BASIC, in that you can change a word definition and "recompile" the program almost instantly so you can try it again. When you change a FORTH program, you actually edit the disk sector that contains the source. Recompiling it consists of not much more (by external appearances) than reloading the file.

FORTH proponents claim that programs may be written much more efficiently than they may be done in Assembler, in terms of programming time vs results. I think that can be said of all the high level languages.

Pascal

Pascal is a language designed to teach "structured programming" to computer science students. The very large program to which I referred above was written in Pascal, so I have more experience with it than with the other languages. Pascal is very precise, and models the "real world" rather well. You can define variable types that can have only certain values. For example, you can define a TYPE COLORS = (RED, BLUE, GREEN), and then a VARIABLE FLAG of type COLORS. Now if you should happen to attempt to assign the value 17 to FLAG, you will get an error, because you have defined FLAG to have the values RED, BLUE, or GREEN only.

I've thought about writing a book on Programming in general without reference to a specific language. I find that I always come back to Pascal for examples because Pascal statements declare precisely what they are doing.

Because Pascal statements are so clear and totally unambiguous, a program written in Pascal by one programmer, is quite easy to follow for another programmer. Pascal is a language that has a good standard, and most of the implementations have only minor variations. There are at least 5 or 6 implementations of Pascal available for our FLEX systems.

On the bad side, Pascal is very "wordy". If you are a slow typist, you might not appreciate it as well as some of the more "shorthand" languages. Also, standard Pascal has virtually no built in functions for handling strings. You must write your own. Though that sounds like a chore, I found it to be rather straightforward, and then found that I didn't very often need the string functions of BASIC, for example. I could build what I needed into the program rather simply. It has been said that Pascal is not very good for linking to hardware such as A/D converters, etc. The better implementations all allow linking to Assembler code, and therefore interfacing to hardware is very straight forward.

C

"C" is a relatively new language. It was written at Bell Labs. "C" compilers for our FLEX operating system are just now becoming available. "C" is a more "concise" language than Pascal, but is not as easy to read. It is a language designed primarily for "Systems Programming", that is, computer operating systems and utility programs, such as disk copying, file transfers, etc. It of course may be applied to many other sorts of problems. This language doesn't have the extensive error checking of Pascal. Pascal will report array subscripts out of range, input numbers out of the required range, etc. C will not report an "overflow" of integer arithmetic, for example. That means that adding 1 to 32767 will result in a value of -32768 with no error reported! The programmer has to be more alert to such possibilities when using "C". Frankly, I have not had sufficient experience with a fully implemented and bug free "C" to know if I like it as well as Pascal or not. I strongly suspect, however, that I will like it at least as well as Pascal after some familiarization time. Some of the shorthand notation is shown below, comparing the Pascal fragment with the equivalent C fragment.

```
IfINDEX := INDEX + 1;           Index++;
IfINDEX := INDEX - 1;           Index--;
INDEX := INDEX + 7;             Index += 7;
BEGIN
END
INDEX : INTEGER;               int index;
```

Parameters are passed to subroutines (functions in C) in a manner very similar to that used in Pascal. C allows "pointer" variables. Int *place; defines the variable place as a pointer variable to an integer. *place references the data in the location pointed at by the pointer. place references the address at which the data is located. If a variable is named "data", &data will get the address of that variable in memory. place = &data will assign that address to the pointer variable *place is now equivalent to data. All that is a bit confusing at first, but very powerful. Assembler code may be included directly in line within a C program.

Assembler

Assembler produces the fastest, most efficient programs but programming in it is very tedious. You can be an expert assembly language programmer in 8080, and know nothing about assembly language programming in the 6809. The language (instruction set) is intimately linked to the hardware of the processor. For this reason, Assembly language is not "portable". That is, a program written for one processor may not be run on another. Programming in Assembler involves a great amount of detail. One line of high level language may require half a

page of instructions in assembly language. Most microprocessor based products that are to be produced in any quantity, are programmed in Assembly language. The result is the highest performance with the least hardware.

BASIC

BASIC is the first language most people new to computers manage to learn. It was designed to be easy to learn for beginners. It has met its design requirements very well. BASIC is usually implemented as an interpreter. It has no compile step. Programs are simply written and run. The interpreter "interprets" the BASIC statements and generates the necessary machine code instructions to run the program, a line at a time. A compiler, on the other hand, analyzes the source code and produces a machine code "object file" which is then run. As a result, most compiled languages run or execute the same or equivalent program considerably faster than BASIC. BASIC is easy to learn and "interactive" because there is no compile step between the writing of the program and its running. I highly recommend that anyone who wants to learn to program a computer learn BASIC first. From the standpoint of learning to become a good programmer, it would perhaps be better to learn Pascal first, but most people want to be able to run their computer in a short time. BASIC is the shortest path to being able to do some fairly complex programs quickly.

Why use a compiled language rather than an interpreted one? Usually, the reason is speed of execution or reduced memory requirements. You don't need to have the whole interpreter in memory when you run the program. Some languages use an "in between" approach. They are neither compilers nor interpreters. Some implementations of Pascal are in this between category. The compiler generates what is called Pseudo code. That is a set of instructions for a hypothetical computer, that is theoretically the same for all the implementations. That set of instructions is then interpreted by a P-code interpreter when the program is run. Theoretically, the same P-code will run on any computer for which the P-code interpreter has been written. The results are intermediate in speed between an interpreted language and one in which the compiler produces "native code" (Assembler source code). To give you some idea of the relative speeds of some of the compilers, TSC 6 digit BASIC may be used as a standard. It is about the fastest BASIC around.

Lucidata Pascal, which is a P-code implementation, is about twice as fast as BASIC. OmegaSoft Pascal, and TSC Pascal, which are native code compilers, run the same program about 10 times as fast as that BASIC. "C" is in the general ballpark with the faster Pascal compilers, and FORTH is perhaps half as fast as the fastest of the pascals.

How efficient are the various languages in terms of size of program required to do the equivalent job? My rule of thumb is that 100 pages of assembler code roughly equal 15 pages of Pascal, 10 pages of "C", or about the equivalent of 5 pages of FORTH. I wrote my "famous" test program to find prime numbers in FORTH once, and it occupied 16 or 20 lines, as opposed to a page or more of Pascal.

How well do the compilers generate code compared to a good assembly language programmer? The better P-code compilers generate less bytes of code for a given program than the "native code" compilers. That is because they rely on the interpreter more heavily. That is, they use "pre written" subroutines extensively. My best estimate is that the better compilers generate three to five times the machine code for a large program, than would be generated by an assembly language program to do the same thing. Some of the compilers only load the subroutines that are called in the program, so that a small program that only uses integer

arithmetic, for example, may have a very small "runtime package". Others simply load the complete runtime package, so that the capability is there for floating point arithmetic, sines, cosines, etc. whether the program ever uses those functions or not.

Why use a compiler rather than BASIC? BASIC has several limitations, aside from being slow in execution. It has the limitation that variables may only have one or two letter names, with a single digit number appended. The very features that make BASIC easy to use, also make it less capable than other languages. Those two letter variable names are hard to remember and associate with their function. Most of the other languages allow long variable names. Compare the following statements.

```
IF HOURS > 40
  THEN PAY := 40 * RATE + (HOURS - 40) * RATE * 1.5
  ELSE PAY := HOURS * RATE;
```

(Pascal program)

```
10 IF H > 40 THEN 40
20 P = H * R
30 GOTO 50
40 P = 40 * R + (H-40) * R * 1.5
50
```

(BASIC PROGRAM)

```
if (hours > 40)
  pay = 40 * rate + (hours - 40) * rate * 1.5;
else
  pay = hours * rate;
```

(C program)

Aside from the use of upper case in Pascal, and lower case for "C", and a few minor syntax differences, the programs look pretty much identical. Most FORTH implementations have only integer arithmetic capability. While it is possible to write software to do money calculations by inserting a decimal point two places from the right, it takes quite a few word definitions to accomplish that. Given such a package, the FORTH equivalent would look something like this:

```
HOURS 40 > IF 40 RATE * HOURS 40 - RATE * 1.5 * PAY !
ELSE 40 RATE * PAY ! THEN ;
```

There are some BASIC compilers around. Many of these are quite "Pascal Like" in that they allow use of variable names and labels. My personal opinion, is that it takes considerable effort to become proficient in a language, and that that effort might best be expended on a "standard" language such as Pascal, C, or FORTH, rather than a unique "Extended BASIC" language. I find it hard to understand why someone would spend a great deal of time generating a unique BASIC compiler when with the same effort, a compiler for a "standard" language could be generated. There is one notable exception to this. If a compiler is written that uses exactly the same syntax as a good BASIC interpreter, the user has "the best of both worlds". He can write his program using the interpreter so that debug is quick. He has all the advantages of being able to change a line and run the program instantly, without any compile step. After the program is running correctly, it may be compiled for speed of execution and compactness!

There are a couple other languages available for our FLEX systems. FORTRAN is around somewhere, as is COBOL. FORTRAN is the original high level language, and as such lacks some of the niceties of the newer languages. It is quite usable, and if you are a FORTRAN programmer from way back, you may prefer it. I have had little exposure to, or experience with Fortran, and am not qualified to discuss it in much depth. PL/M or PL/C are available in some implementations. PL is rather

similar to Pascal. COBOL may be preferred by longtime business programmers. COBOL is VERY wordy compared to all of the other languages discussed here.

In quick summary, FORTH is rather cryptic looking. Pascal is very easy to read, but disgustingly hard to "short cut". It has so many built in safeguards, that it is very hard to "cheat". "C" is efficient, but lacks the safeguards that Pascal has. BASIC is easy to use, but it is hard to write a well documented clear program in it. On the others, I don't feel particularly qualified to comment.

I said something in my last attempt to do this sort of analysis and comparison, that bears repetition here. Fortunately, we don't all have to like the same thing. The only way to find out what suits you, is to try several languages and see what their advantages and disadvantages are. Depending on the type of programs you write, and your personality, you will like one of those languages above all others. If you like it, and it is easy for you to use, by all means, don't listen to what someone else thinks, just use it and like it.

COLOR User Notes

Robert L. Ney
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Hixson, Tn. 37343

This month we'll look at several items for the Radio Shack TRS-80C™ Color Computer. We have a couple of new 'gadgets' for the ROM Pak Slot; we'll look at some improvements on the Chips in the Computer from Motorola; and we have some New Product announcements, including a new Disk Operating System for this Computer from Star-Kits. We'll have to delay the Radio Shack Editor-Assembler report a little due to lack of time to adequately use it -- sorry.

I received a couple of items from one of our "Northern Neighbors", Ted Baleshta, 42 Herrington Court, Nepean, Ontario, Canada K2H 5N7. The first is little 2 Socket EPROM Board which he calls the K2468 Module. This is a simple little PC Board with two 24 Pin Sockets which can accommodate up to 16K of EPROM. It uses PC Land Cuts to select the type of EPROM being used. The Board is the width of slot in the Connector (a couple inches), and about 2 1/2" long. It is a neat little unit that has all the hard work already done. Contact him for pricing.

Ted also sent a Buffered Expansion Board for the ROM Pak Slot which he calls the Colour Buffer. This is a PC Board with Gold Plated Edge Connections to plug into the Cartridge Slot. It contains four IC's to provide full buffering for the Cartridge Lines, and has a standard 44 pin (22 on each side, .156" spacing) Female Connector on the output which will accept the standard 44 pin Proto Boards, such as the Radio Shack #276-1550. This will make Expansion of the Cartridge Interface easy and inexpensive. This is an item that has been needed for a while to make development a lot easier on the Color Computer. Again, contact Ted for pricing.

New Motorola Chip Designs, General Ramblings, etc.

Last month I mentioned that we had received a new MC6883 from Motorola - but I really didn't know what it was. Now I know. Back the first of the year I ran a couple of these Columns on the MC6883 and its capabilities, and discussed the Type #0 and Type #1 Memory Maps. If you remember, you can run the CPU Clock at 1.8MHz in the Type #0 Memory Map, either in the 'Address Dependent' mode, where part of the Memory Access Area runs at double speed, and part at normal speed, or you can run the whole 64K at double speed. The problem was that you could NOT run at 1.8MHz in the Memory Type #1, or ALL RAM, Mode. WELL, NOW I CAN! This new MC6883 is supposed to run at 1.8MHz in THE ALL RAM Mode. Since I just found this out about an hour ago, I

haven't had a chance to try it out, but at least Motorola is on the right track. The only thing really holding the Color Computer back is the CPU Speed; and this could be the development we need to really 'turn this Machine loose'. We can by-pass the Keyboard/Video Display restrictions with some Software (such as Star-Kits REMOTE™, to mention one of several) and a Terminal such as the ADDS series, TELEVIDEO series, ADM series, etc. The Color Computer is already capable of working with 96K of Memory; and the Memory Map switching capabilities I just mentioned are still UNPARALLELED IN THE INDUSTRY. Combine all of this with a 1.8MHz CPU Clock and 8" Double Density Floppy Disk Operation becomes "routine", along with Hard Disk Operation, Multi-User Capability, etc. Sound good?? It is easily possible, WITH A NORMAL CPU CLOCK RATE OF 1.8MHz!!

But, I would like to point out TWO THINGS. FIRST, Motorola needs to be convinced that the 1.8MHz ALL RAM capability is NEEDED (and that they need to put the MC6883 and its capabilities "OUT ON THE OPEN MARKET"). This can only be accomplished by YOU, through requests for this, and other features, to Motorola. They are 'receptive' to new ideas; the MC6809 has to be a prime example of this. LET THEM KNOW WHAT YOU WANT!! The man to contact! is:

Mr. Luis Bustamante
Product Marketing Engineer
Motorola Inc.
P.O. Box 20906
Phoenix, Ar. 85036

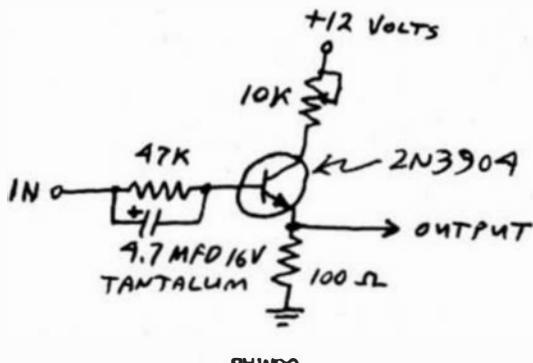
(Let me point out, also, that the MC6883 has an UNLIMITED POTENTIAL in the Control Applications field, too. We haven't really investigated the DMA Capabilities of the Chip, to mention just one of the other areas of possibilities. You "Systems Design" Types should give this Chip a HARD LOOK; it can solve a LOT of problems.)

The SECOND point I would like to make is this: while we have been 'examining possibilities' and 'developing' the Radio Shack TRS-80C™ Color Computer into a "Full Blown Computer System", I am NOT saying that this is the 'ultimate solution' to providing a Full Computer System for a Business Environment, either. If you have a VALID COMPUTER SYSTEM REQUIREMENT, for goodness sakes, buy a Southwest Tech, GIMIX, Hellix, Smoke Signals, etc. It will be MUCH LESS EXPENSIVE and MUCH MORE POWERFUL than you will EVER be able to accomplish with the Color Computer. My primary 'thrust' with this Column has been with two ideas in mind:

1. That the Radio Shack TRS-80C™ Color Computer offers the most CAPABILITY per DOLLAR INVESTED of any Micro-Computer available Today, and that the manufacturer, namely Radio Shack, DID NOT KNOW WHAT THEY HAD when they came out with the Computer. (And I'm not throwing rocks their direction, either. They saw it as an inexpensive Computer System for the ENORMOUS Home Computer market, and that is the 'target' they aimed at. I will also add that I feel they are doing a pretty good job of supporting the System WITHIN THEIR FRAMEWORK of WHAT THEY WANT TO ACCOMPLISH with the Color Computer.)
2. That the Radio Shack TRS-80C™ Color Computer offers a means for "John Q. Public" to begin with a Computer System for little more than the price of a 'Video Game System', and by adding a little here, and a little there, end up with a POWERFUL COMPUTER SYSTEM. Not only can he spread the cost over a long time period, but, HE CAN ALSO SPREAD THE LEARNING CURVE over a long time period. In essence, he can 'learn as he goes', while he 'pays as he goes'. AND, what he learns is DIRECTLY TRANSFERABLE to the previously mentioned FULL BUSINESS SYSTEMS. He is also learning about the most powerful 8-bit Computer Chip available today, and it will be around for many years. But, as I mentioned before, it will cost MUCH LESS MONEY to go ahead and purchase one of the FULL BLOWN BUSINESS SYSTEMS you see advertised in '68' Micro Journal if you ALREADY HAVE A VALID BUSINESS REQUIREMENT for a Computer System.

We have been hearing RUMORS (pretty solid ones, too) about a new MC6847 Video Display Generator Chip. I have not seen one yet, but understand that it has a 16 Color capability instead of the 8 we now have, and that it also contains greater Luminance controls, allowing much more flexibility in displaying shades, etc. I would appreciate any information anyone has on this subject, as it would add A LOT to the Graphics Capability of the Color Computer. We are already seeing the TRS-80™ being selected over Apple, NEC, Atari, etc. for certain kinds of Graphics work. For instance, we have been working with an organization that needed an UNLIMITED number of Color Changes per line. It seems that most of the other Systems only allow a certain number of CHANGES PER LINE; they may offer more colors, but you can only change color so many times per scan.

Along these same lines, we have been running the Color Computer on the Amdek Color I and Sanyo Color Monitor the last month. These Monitors require a 1 Volt P-P NTSC analog input. Since the input into the RF Modulator is an NTSC analog voltage, the simple Emitter Follower driver shown below provides a simple modification that works well. I won't provide a full modification procedure (we'll include it in a later issue if there is enough requests for it); it is extremely simple and those accomplishing it will be able to 'stick it in' with no problem. Since the input is High Impedance, and output is Low, we have had NO loading or noise problems with the Mod. We install the Amp. Just to the left of the RF Module in the Computer and bring a short lead out the Cassette Connector hole with an RCA Female Connector on it so that we can use the same RF Cable for the TV or Monitor, just plug it into whichever connector you want to use. The next step in this chain is to develop a method to get an R-G-B Output from the Color Computer; any of you with ideas here, send them in.



A "smart" Disassembler for the Color Computer

Ron Levine Software
P.O. Box 356
Redwood City, Ca. 94064

Requires 16K w/ Extended BASIC
Tape: \$24.50

"BWINDO is a smart disassembler and cross-referencer with many unique features." This is the lead-in to the description of a Tape Program for the TRS-80™ Color Computer that is 'different', to say the least. BWINDO is a Disassembler that is designed to do JUST ONE THING; help the user 'decipher' the BASIC and EXTENDED BASIC ROM's of the Color Computer. The output is not in a format that can be easily reassembled; it is in a format that makes INTERPRETATION easier. You don't have to spend hours and hours studying the disassembly to locate data areas, program areas, etc.; BWINDO already knows where these are. The data is displayed as 'Keywords', 'Jump Tables', etc. Floating Point constants are displayed both as they are stored internally, and in 'human-readable' form. Other data blocks contain their own annotations. BWINDO makes it easy to locate entry points of keyword routines, etc.

Another feature of BWINDO is that it provides TWO Cross-Referencing routines:

1. In the "storage reference" mode, you can enter ANY address in the 64K Memory area, and it will display a table of all ROM instructions which reference that address.
2. In the "transfer reference" mode, you can enter either an address, which provides a table of all the addresses that transfer control TO that address; or, enter two addresses and the table provides the addresses that transfer control ANYWHERE WITHIN the specified address range.

As I stated at the beginning, this Program is designed for ONE THING ONLY; STUDYING THE ROM's. When you load the Program, it begins execution by disassembling from \$A027 (the RESET Entry point). But, you have complete control of the Program; you can move back and forth with the 'arrow keys', 'Jump' to any location to begin disassembly, etc. You can also either dump a display screen to the Printer or initiate a continuous Printer output (which can be halted at any point by hitting any key). There are helpful notations added in the normal "comments" field of the output, pointing out 'Keywords', Control Characters, Floating Point Routine Info, etc. Personally, I feel the real 'strength' of BWINDO is the Cross-Reference capabilities. These allow you to find all references to any point in the system for studying what routines use what variables, which routines are called by which Commands, etc.

No, this is not a Disassembler that can be used for studying various programs, ROM Paks, etc. (The Micro Works has one that does an excellent job for that purpose). It IS an extremely powerful SPECIALIZED Disassembler designed for one purpose ONLY; studying the BASIC and EXTENDED BASIC ROM's in the Color Computer.

NEW Color Computer DOS Announced

Pete Stark, the Owner, Manager, Chief Programmer, Chief Admin. Officer, etc., of Star-Kits, P.O. Box 209, Mt. Kisco, N.Y. 10549, has announced the release of his

STAR-DOS™

for the Color Computer. (See the Bit Bucket this issue for his Product Announcement.) This should be an excellent product. We hope to have a full report in the next month or so.

Bob Rasen adds another system to his CONNECTION-80 Bulletin Board System

Many of you are familiar with the excellent CONNECTION-80 Bulletin Board that Bob has had on line for some time now (212-441-3755). He has added a second computer system to expand the capabilities; this is a 32K Color Computer with Three Disk Drives. The Software for the system was written by J. Blech, and will be available to anyone interested in setting up a similar system. You can access this system by dialing 212-441-3766, or if you have come in on the original -3755 number, and it is busy, you will be transferred automatically to the Color Computer System (if it's not busy). Bob also has some excellent products available through his SPECTRUM PROJECTS Co. to go along with all the myriads of info on the Bulletin Boards.

EIGEN SYSTEMS announces BASIC AID ROM Cart.

Again, look in the Bit Bucket for the Product Announcement from EIGEN SYSTEMS on their new ROM PAK. This Pak provides many features needed to efficiently program with the BASIC Language in the Color Computer, such as Automatic Line Renumbering, Single Key Entry of Commands, etc. One of the more powerful features is the MERGE Command, which allows the programmer to build 'modules' and merge them into programs as needed. This

makes 'Structured Programs' much easier; which makes debugging simpler, allows the use of 'proven' routines, and helps eliminate 'reinventing the wheel' each time you need a common routine. The \$35.95 price tag includes the ROM PAK, a Plastic Keyboard overlay, and a full Instruction Manual.

MARK DATA PRODUCTS releases another Game -- Astro-Blast

Yet another Product Announcement for this month (again, see the Bit Bucket), this one from MARK DATA PRODUCTS. Their Games have set 'Standards' for the industry, and this should be another good one.

C O L O R C L I N I C

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It's two o'clock in the morning and you are typing away on your TRS-80 Color Computer. Your eyes are burning because you've been staring at that bright green screen trying to create your "Do everything program" for hours. So you turn down the color, contrast and brightness of the display but that doesn't help too much. It's still a big square of light. Well...what can you do? Follow these simple instructions and when you are finished you will have a reversed screen like mine.

Though these instructions are simple only those with soldering experience should attempt this project. You will need a Phillips screwdriver, a grounded soldering iron, solder, an IC extractor, two pieces of thin wire, flux cleaner, and a little patience. Oh by the way, opening your computer may void your warranty.

THEORY

Before you start tearing into your computer, a bit of background on the VDG (Video Display Generator) is in order. The VDG is a large scale integrated circuit (LSI) chip that takes care of all the video you see on the screen, be it Alphanumeric or full graphic. The VDG continually scans memory (Via the SAM) and displays what it sees. In the Alphanumeric mode it converts the ASCII code of a byte of memory into a graphic block that looks like the letter it represents. Normally an upper case letter or number is black with a green background. Lower case letters are the opposite, green with a black background. What my circuit modification does, is reverse the order so that upper case letters are green with black background and lower case letters are black with green background. This does not change anything in

memory nor does it interfere with Basic. It also does not change any graphic modes or colors. Everything stays the same except the letters, numbers and symbols. The diagrams in this article pertain to any and all versions of the computer. Version 1.1, 1.5, 4k, 16k, 32k, 64k, BASIC, EXTENDED BASIC and even DISK BASIC are OK.

PART ONE. The Opening.

Before you start into this make sure that you have a large clean work space. Make sure the computer is not plugged in. Put the computer upside down on a soft surface. Unscrew the seven screws that holds the cover on. If you haven't opened it before, the seventh screw is under the black sticker that warns you not to open this thing. Turn the unit over again (top side up) and pick up all the screws that fall out. Put them aside in a safe place. Remove the top cover and put that away too. Lean forward slightly and gently pull up on the keyboard. Unplug the connector that ties the keyboard to the main board. Put the keyboard aside. Now cut the two tie wraps that hold the RF shield in place. That's the big square piece of metal with holes in it. Remove the RF shield and put it with the other parts. You are now ready for part two.

PART TWO. The Modification.

Before you start part two, let me tell you that the board is very sensitive to static electricity. Try to avoid dry areas and avoid touching the contacts on the board whenever possible. Ok, let's get going. Locate and pull out the 74LS02 IC marked U29 on the PC board. Carefully bend pins 1, 2 and 3 so they stand

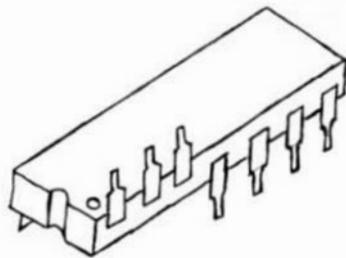


FIG-1

straight up in the air upside down. The dot denotes pin #1. If you are facing the computer it is the top left hand corner. See FIG 1. Now solder one end of a 4 inch piece of wire to pin #1 of the IC. The best wire to use is a #28 or #30 Wire Wrap wire. Solder another piece of 6 inch wire to pins 2 and 3. Yes both pins together. Now put the IC back in the socket. Make sure it is in the right orientation, the dot should be in the upper left hand corner. Also make sure that the wires and the pins do not touch the side of the RF shield. Now carefully remove the MC6847 IC marked U7 on the PC board. Bend pin #32 outwards just enough so that when you replace it, it does not go into the socket. Replace the MC6847. Again make sure of the orientation. The dot should be in the upper right hand corner. Take the other end of wire that connects to pin 1 of the 74LS02 and solder it to pin 32 of the MC6847. Take the other end of wire that connects to pins 2 and 3 of the 74LS02 and solder that to pin 2 on the MC6847. Be careful not to solder the pin to the socket. You won't be able to get the IC out if you do. Check the wiring and make sure that there are no shorts. Your wiring should look like the wiring in FIG 2. Now turn the power on. You should see the normal BIGN ON and copyright notice. Adjust the contrast, brightness and color on your TV so that you get crisp green letters with no background shading.

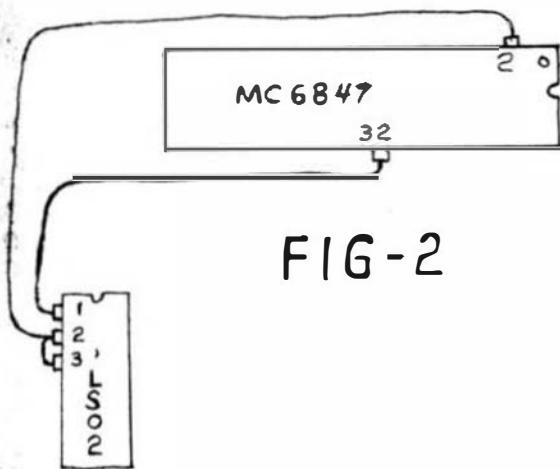


FIG-2

PART THREE. The Closing.

The closing up of the unit is the same as the opening but in reverse. Turn the power off and replace the RF Shield. Again, make sure that there are no wires hanging out and that there are no small pieces of wire or solder left in the closed area. Replace the keyboard and connector and put the lid back on. One thing to note, when you are putting the bottom screws on is that there are two short screws. They go under the keyboard. If you put the long ones there it will pierce a hole in the top cover. Do not overtighten them. After the computer is all back together again check all the functions just to make sure that all is running properly.

REPRISE

The whole operation should go off without a hitch, but if you do have problems drop me a line and I'll try to help you solve your them. Some of you might want to add a switch to be able to change back and forth between normal and reversed screen. To do so follow the wiring diagram in FIG 3. Make the wires long enough to be able to mount the switch on the outside cover. Warning!! Wires that run outside of the RF shield can cause interference with your TV.

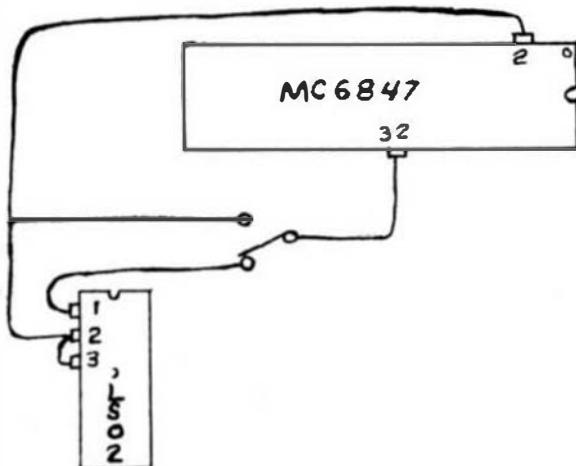


FIG-3

Coming soon! A small hardware project that will allow you to switch between normal and reversed screen in software. I.E. "POKE X,Y", where X = the memory mapped location and Y = 0 for normal screen and Y = 1 for reversed screen.

"C" User Notes

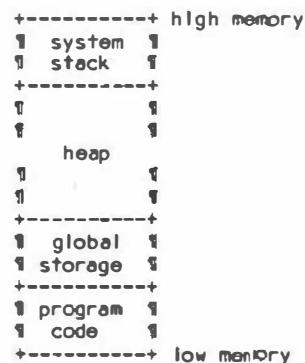
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This month we will look at the runtime environment provided by some of the different compilers. Then an example of how this is used in a program.

What do I mean by the runtime environment? Primarily the initialization code before actually entering the user program at main(). This will usually involve setting up the stack pointer, initializing global and statics and other sorts of similar things.

Any stack oriented program, especially if it is also recursive, can chew up stack space. C is no different. You will find that most the runtime packages set the stack pointer to the location contained in MEMEND (FLEX location \$CC2B). This prevents running out of stack if there is empty space between user memory and \$C000.

Some also save the old SP value before setting it to MEMEND and set up a HEAP pointer that will can be used by the program for dynamic memory allocation. The heap is the space in memory between the user program (including variable storage) and the stack. This is shown below



Global (and statics) are treated a number of ways. Many of the Small C compilers generate code that reference globals as absolutes addresses. The storage is generated with either RMB's, which are uninitialized; or with FCB's which set the variables to some predetermined value. Compilers that produce reentrant code, such as Intra, usually reference the global area via a pointer. Intra use the Y register and initializes the global pool to zero at runtime. Of course, if a compiler offers "initializers" as defined in the C standard, then you have the option of setting the variables to whatever value that you want.

Many of the FLEX C runtime packages attempt to provide the user with some of the amenities of the UNIX operating system. These include command line parsing and I/O redirection. I have explained these briefly before, but let's review them in a little more depth.

I/O REDIRECTION

Both the Introl and Intersoft runtime packages support I/O redirection. The UNIX environment, as described in K&R(I), has three "standard" files associated with any program, which use the following descriptor

```
STDIN -- the keyboard
STDOUT -- the terminal display
STDERR -- the terminal displays
```

Their values are defined in STDIO.H. These files are really I/O devices. Using these standard "files", you can test the program using your terminal. Once you are satisfied that it works, it may be used on real files by REDIRECTING the I/O.

Redirection is done from the keyboard when the program is called. Assume you have developed a program, named caselo, that translates all letters into lower case. It has been tested and found to work. Now you want to convert a file to lower case. The command line is

```
+ticaselo <infile >outfile
```

Within the program, all I/O is done via the standard terminal routines such as getchar() and putchar(). But the runtime package scanned the command line and found the redirection symbols. It opens Infile and connects it to getchar(). Similarly, outfile is opened and connected to putchar(). Error handling in the event of problems opening any of the files varies with the vendor.

This is very similar to the I and O options of FLEX. The above command line could most likely have been accomplished with

```
+H Infile,O outfile,caselo
```

There is nothing wrong with this method, though I personally prefer the UNIX format. OS9, both levels one and two, support I/O redirection using the UNIX format.

Both the Introl and Intersoft terminal I/O functions look something like this

```
getchar()
{
    return(getc(STDIN));
}

putchar(c)
{
    char c;
    putc(STDOUT,c);
}
```

In fact, if you want to, you can write all your terminal I/O directly using the file function getc() and putc() with the file descriptors STDIN and STDOUT respectively. Moreover, you could use putc() with the standard error file, STDERR. It is more verbose, but it has some advantages. Assume that you have a program whose output includes both data, prompts and error messages. Having the error messages and prompts imbedded in the data may be of little consequence if the output is being scanned at the terminal. But when you redirect the output, it may be quite undesirable to have it mixed. This can be avoided using the following technique.

All data is written using the functions putc() and fprintf() as follows

```
putc(STDOUT,a real char);
fprintf(STDOUT,"a Real output string");
```

Error messages and prompts also use putc() and fprintf() but with the minor change

```
putc(STDERR,a error char);
fprintf(STDERR,"an error string");
```

At this point you can do just about anything you want with redirection. Consider the following line.

```
+Hprogram <infile >outfile >errorfile
```

Here Infile is connected to STDIN, outfile is connected with STDOUT and errorfile is connected with STDERR. FLEX has no equivalent for this.

One of the things about OS9 is that it does I/O redirection at the operating system level. Any program written for an OS9 system, in any language, may have the I/O redirected, it comes with the system.

COMMAND LINE PARSING

Redirection is handy, but the workhorse feature of these runtime packages is command line parsing. This makes getting at the FLEX command line arguments from within the C program a breeze.

The FLEX command line is parsed, with the arguments converted into valid C strings by terminating them with a NULL. The line may be stored in a buffer before the parsing, it depends on the particular runtime package. A count is kept on all the arguments and an array of pointers to each of the arguments is built up. Finally, the program is entered with the argument count and a pointer to the array on the stack. Consider the following FLEX command line

```
+Hprogram arg1 arg2 arg3
```

The argument count is 4 since the program name is included by convention. An array of pointer is built as follows

```
+-----+
| 3 | pointer to arg3
+-----+
+-----+
| 2 | pointer to arg2
+-----+
+-----+
| 1 | pointer to arg1
+-----+
+-----+
| 0 | pointer to program name
+-----+
```

Note that each pointer is two bytes. Suppose we had a program that started like this

```
main(argc, argv)
    int argc; /* argument count */
    char *argv[]; /* pointer to an array */
```

main() would be entered with argc set to four and with argv set to the address of argv[0], which contains the pointer to the program name. Small C users beware, the declaration

```
char *argv[];
```

will probably get you into trouble. It states that argv is an array of pointers to char's. Some Small C compilers can't seem to handle more complex definitions like this. You will have to use

```
int argv[];
```

since pointers and integers are both two byte quantities.

I have included two listings this month. Listing #1 is a quick cut at adding command line parsing to the Dugout version #1 runtime package. It is by no means the most efficient way of doing it, but I wasn't acquainted with the quirks (if any) of FLEX's NXTCHR subroutine. In

does use NXTCHR, so I know it can be done. Also take note that it doesn't save the command line to a buffer. It changes the FLEX argument separators to NULL's within the command buffer. If you chain to command on the same line and the first used this code, it will blow up on you.

The second is a program called YU. This is a program for perusing through text file. It gives an some examples of how argc and argv are used. You might have to customize it a little for your system. I did not make use of gets() since I wanted the line to be terminated by a number of different command characters yet still retain some elementary line editing. I did this in C, but without using the BS and BE characters from TTYSET. The editing is designed for my particular terminal, an H19.

Users of Dugger version 1 will have to change the switch() to a series of "if then else" statements and the escape characters, "\n", "\r" and "\b" to decimal constants or equated symbols such as LF, CR and BS respectively. Other than that, and customizing the prompts for your terminal, it should not present a problem for the varlous compilers.

WHAT'S NEW

I am still waiting for Microwares OS9 C compiler. If you have read the some of the ads in 68 Micro I am sure you have notice that just about all the C compiler makers plan to have OS9 versions available at some time. I suspect that either Microware or Introl will probably be first to actually ship them, but I haven't check with the other vendors.

Some good news for stalwart 6800 users. I received a copy of a letter from 68 Micro reader Serge Stepanoff to Don. He has apparently developed a Small C compiler for the 6800 that generates pseudo code, which is then interpreted. More news will follow, or perhaps an article by Serge.

The next column will most likely cover some features of C not offered by Small C compilers. These are the "struct" and "union", as well as a few compiler operators such as sizeof().

NOTES

(1) K&R stands for "The C Programming Language", by Kernighan and Ritchie, published by Prentice Hall.

LISTING #1

```

; C program entry code.
; It inits SP and UP, parses the
; command line into argc and argv,
; calls main(), and restores SP
; and UP on exit.
;
CINT  JSR    ZPCRFL
      PSHS  U      save system UP
      STS   FLXSTK,PCR
      LBS   #CC2B    set SP to MEMEND
      LEAU  -256,S   leave 256 bytes of stack
      CLR8  ,Y      clr argv, and...
      TFR   B,DP    set DP to a known page
      LEAX  CCCAV,PCR  point to argv space
      LDY   #FLXLIN  point to cmd line
      CCINI LDA   ,Y      end of line?
      BEQ   CCIN3
      CMPA  #13

```

BEQ	CCIN3	
BSR	CCINS	skip separators
CMPA	#13	
BEQ	CCIN2	
LSLB		
STY	B,X	stuff it into CCCAV[28]
LSRB		
INC8		
BSR	CCIN7	find next separator
CCIN2	CMPA #13	end of line?
BEQ	CCIN3	
CLR	,Y+	no, set null and loop
BRA	CCINI	
CCIN3	CLRA	set null and call main()
STA	,Y	
PSHU	D	push argc
PSHU	X	push pointer argv array
ASLB		
LEAX	B,X	set end of array to null
CLR	,X+	
CLR	,X+	
STX	CCCEND,PCR	init free ram pointer
LBSR	MAIN	

```

;
; exit()
;
; returns to FLEX after restoring
; the system stack pointers
;
EXIT EQU :
CCCEX LDS   FLXSTK,PCR  restore FLEX SP
      PULS  U      and the USP
      JMP   ZWARMS

```

```

;
; skip separators (space and comma)
;
CCIN4 LEAY  1,Y
      LDA   ,Y
CCIN5 CMPA  #20    skip blanks and commas
      BEQ   CCIN4
      CMPA  #',,
      BEQ   CCIN4
      RTS

```

```

;
; skip over a real argument to find
; the next separator
;
CCIN6 LEAY  1,Y
      LDA   ,Y
CCIN7 CMPA  #33    find next blank or comma
      BEQ   CCIN8
      CMPA  #20
      BEQ   CCIN8
      CMPA  #',,
      BNE   CCIN6
CCIN8 RTS

```

```

FLXSTK RMB 2      flex SP saved here
CCCEND RMB 2      pointer to free ram
CCCAV EQU $       
```

VU command	Action
<cr>	list another line of the file
<space>	list another window of the file
^D	list 12 more lines

VU.CMD is a file perusal program. With it you may glance through files casually without needing to be 'quick on the finger' with the pause key! One of the biggest limitations of VU is that it is strictly one way. You cannot backup because only one sector at a time is buffered.

VU moves a 'window' through the file. Initially the window is set to 23 lines. After each command, VU prompts the user with "--more--" if there is more of the file to be viewed, otherwise it returns to FLEX. Some commands may take an optional number in front of them. No <cr> is necessary after a command key.

VU command	Action
<cr>	list another line of the file
<space>	list another window of the file
^D	list 12 more lines
nn<space>	list nn+1 lines of the file
nnF	skip nn windows of the file
nnS	skip nn lines of the file
nnZ	change the window to nn lines
Q	quit to FLEX

```

/J
1 vuc      rews 1
2 n f cooo
1
1 created:  Mon-7-81
1 last edits:  Jul-2-82
1
1 A program to aid perusing disk files.
1
1 #define CRTSIZE 24 #define FOREVER while(1) #define BOOL int #define
#INCLUDE int #define TRUE 1 #define FALSE 0 #define ERROR -1 #define EOF -1
#define FILE char
FILE *fcb;
main(argc,argv)
int argc;
char *argv[];
{
int i;

if (argc < 2)
{
printf("Usage: vu arg [args]"); exit();
}

i = 0;
while(i< argc)
{
if ((fcb = fopen(argv[i],"R")) == ERROR)
printf("Error opening file: %s",argv[i]);
else
{
display();
fclose(fcb);
}
}
} 
```

```

display()
{
int linecnt, maxcnt, newmax;
char c, anstg[10];

maxcnt = newmax = CRTSIZE;
linecnt = 1;
FOREVER
{
while (linecnt++ < maxcnt)
{
if (dumpline(TRUE) == FALSE)
return;
}
prompt();
maxcnt = newmax;
linecnt = 1;
c = answer(anstg);
if (isdigit(anstg[0]))
maxcnt = atoi(anstg);
switch(c)
{
case ' ' : break;
case 'f' : killprompt();
printf("skipping 2d screenfulls",maxcnt);
maxcnt = maxcnt + newmax;
skiplines(maxcnt);
maxcnt = newmax;
break;
case 'q' : killprompt();
return;
case 's' : killprompt();
printf("skipping 2d lines",maxcnt);
skiplines(maxcnt);
maxcnt = newmax;
break;
case 'z' : newmax = maxcnt;
break;
case 'r' : linecnt = maxcnt - 1;
break;
case '004' : maxcnt = 11;
break;
default : printf("007");
break;
}
killprompt();
}
}

skiplines(lines)
int lines;
{
while (--lines)
{
if (dumpline(FALSE) == FALSE)
return;
}
}

dumpline(pmode)
BOOL pmode;
{ 
```

```

METACHAR c;
FOREVER
{
    if ((c = getc(fcb)) == EOF)
        return(FALSE);
    if (pmode == TRUE)
    {
        putchar(c);
        if (c == 'r')
            putchar('\n');
    }
    if (c == 'n')
        return(TRUE);
}
}

answer(s)
char *s;
{
char c, *p;
p = s;
FOREVER
{
    c = getchar();
    if (isdigit(c))
    {
        *p++ = c;
        continue;
    }
    else if (c == 'b')
    {
        if (p > s)
        {
            printf(" b");
            p--;
        }
        else
            printf(" ");
        continue;
    }
    else
    {
        *p = '0';
        return(tolower(c));
    }
}
}

/* the following two routines must be
* change for the particular terminal
* in use.
*
*
*
* 1) set inverse video
* 2) write the prompt
* 3) restore normal video
*/
prompt()
{
    printf("#33p--more--#33q  ");
}

/* 1) set cursor at beginning of line
* 2) erase the line
*/
killprompt()
{
    printf("r#33l");
}

```

TELECON C

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The C programming language developed at Bell Laboratories was originally designed for, and implemented on, the UNIX operating system on the DEC PDP-11. C is becoming more popular on microprocessors especially with the appearance on the market of several reasonably priced compilers. These compilers have been designed to operate on 6809 FLEX and OS-9 systems as well as other processors such as the 8080, Z80, and 8086 under CP/M. However most of these compilers have implemented only a subset of the language as described by Brian W. Kernighan and Dennis M. Ritchie in the book The C Programming Language. The Telecon System's C compiler is available for 6809 FLEX, 8080, 8085, Z80, PDP-11, and soon on 6809 OS-9. This compiler is one of the most complete implementations available on the market and lacks only bit fields, multidimensional arrays, floating point and double precision floating point. Telecon says that floating point and multi dimensional arrays will be implemented by July 1982.

The input to the compiler is standard C source, compatible with UNIX, version 7. The output is an assembly language file in which the C source may be intermixed as comments which is then assembled to produce an executable file. The compiler requires approximately 48K bytes of ram, which includes all stack and symbol table areas. The following data types are available: char (8 bits), short int (16 bits), long int (32 bits), unsigned (16 or 32 bits), array, pointer, structure, and union. The floating point data type will be 32 bits with a 7 bit excess 64 exponent and a 24 bit mantissa. Constants may be expressed in the form of strings, characters, decimal, octal, or hexadecimal numbers. The entire set of unary, binary, and assignment operators are implemented including sizeof expression and sizeof (type-name) or casts. The available storage classes include: auto, static, extern, register, and typedef. Static and extern variables may be initialized at compile time. A complete set of program statements are implemented, including: if, if else, while, do while, for, switch case, goto, default, break, continue, and return.

The preprocessor is extensive, including #define with replacement string and replacement macro, and undef. Conditional compilation expressions with #if, #ifdef, #ifndef, #else, and #endif are

available. There are two other constructs, `#text` and `#endtext`, which allow non-C text to appear in the source program, such as assembly language code, and is similar to the `#asm` and `#endasm` implemented in other compilers. The I/O library is rich in functions, with both character puts and gets, and file formatted input and output. In memory formatting is also available. Numerous string and character handling functions are implemented in the library.

The compiler is supplied on both 5" and 8" standard FLEX disks. The compiler occupies 146 single density sectors. The standard I/O library is found in source form and is available from one of two files "stdio.h" or "stdio.l" (33 and 27 sectors respectively). The "stdio.l" file has less features than the "stdio.h" file and only one is included in a C source program. The runtime library and FLEX Interface ("rlib6809.s" and "fixoei.s") are in source form and require 22 and 18 sectors respectively. When the compiler is invoked a "shell" is entered which provides a UNIX compatible environment for C programs and allows UNIX command lines with command line parsing and I/O re-direction. When the "shell" is entered a `++` prompt is displayed on the console. For example, to compile a C program to compute the prime numbers between 3 and 16381 using the Sieve of Eratosthenes algorithm found in BYTE, September 1981, the following steps would be required.

`++cc30fx` (Invoke the compiler)

`++ sieve.c rlib6809.s fixoei.s -a -c >sieve.s` (Input command line)

`++asmb,sieve.s,sieve.cmd,+LS` (assemble the 6809 source)

`++[cr]` (carriage return starts program execution)

10 Iterations

1899 primes

`++`

The command line in the "shell" provides switches `(-a, -c, -l, -n)` which permit absolute or relocatable output and other features. Following assembly, the 6809 source file (`sieve.s` in this example) which occupies 98 sectors may be deleted leaving only the executable file (`sieve.cmd`) which occupies 15 sectors.

A comparison among this compiler, Dugger's C version 2.1, previously reported 6809 Pascal compilers (from 68 Micro Journal, Nov. 1981) running at 1 Mhz and Z80 compilers running at 4 Mhz (from Byte Sept. 1981) is shown in Figure 1. The Telecon C compiler is the fastest for the 6809 and does relatively well against the Z80 compilers.

Another benchmark for computing random numbers using a linear congruent sequence is given in Figure 2. This program produces a sequence of 126 random integers and test the speed of the single

precision (16 bits) integer arithmetic. The results of this benchmark run on the Telecon C and Dugger's C are shown in Figure 3.

The compiler displays diagnostics only on the console and permits only one error per line, which is a definite advantage since one syntax error may cause multiple diagnostic lines to be generated in some other compilers.

The manual supplied by Telecon is brief but complete enough to allow one to use the compiler. It contains a short description of the C programming language features implemented in the compiler. There is not a list of diagnostic messages in the manual and only a brief description of the UNIX "shell" command line syntax. The manual does provide a description of parameter passing and the stack format which permits external routines to be easily constructed and interfaced. The features described in the manual appear to be implemented in the compiler and to operate correctly.

The compiler is currently available from TELECON SYSTEMS, 90 East 61st Road, Suite 25, San Jose, California, 95112. The full version costs \$350.00 and an "integer only" version (which cannot be upgraded to the full version) costs \$200.00. The compiler prices include free updates for one year.

This compiler makes available a very complete version of the C programming language to the 6809 user at a reasonable cost. The code produced is fast and relatively compact. I would definitely recommend this compiler for users who require the full features of the C programming language.

References 1. Kernighan, B. W. and Ritchie, D. W. The C Programming Language Prentice-Hall, New Jersey, 1978
 2. Gilbreath, J. A. A High Level Benchmark. Byte 6(9): 180-198 Sept. 1981
 3. Anderson, R. W. Flex User Notes. 68 Micro Journal 3(9): 9-11 Nov. 1981
 4. Elbert, T. F. Simulation, Games, and Random Variables 68 Micro Journal 3(9): 20-22, Nov. 1981

Figure 1 Prime Number Benchmark Comparison

Compiler	Execution Time	Total Bytes
Digital Research PL/I	14.0 sec	5977
Whitesmiths C	15.5 sec	7384
BO Systems C V1.32	49.5 sec	3932
Telecon C	43.4 sec	13484
Dugger's C V2.1	65.4 sec	21784
TSC Pascal	59.0 sec	14334
Omegisoft Pascal	66.0 sec	2465
Dynasoft Pascal	143.0 sec	1490
Lucidata Pascal	158.0 sec	3929

8 MHz Z80.

Figure 2 Random Number Benchmark Program

```
#include <stdio.h>
int rint(126), seed, an, cn, mod, niter;
main()
{ int i, xn, iter, k, count;
  seed=100;
  an=3;
```

```

cn=0;
mod=127;
niter=10;
printf("%d iterations\n",niter);
for(liter=1;liter<=niter;liter++)
{
  xn=seed;
  for(i=0;(i<125;i++)
  {
    xn=(anBxn+cn)%mod;
    rint[i]=xn;
    count=1;
    for(k=0;k<i;k++)
    {
      if(rint[i]!-=rint[k]) count++;
    }
  }
}
printf("\n% random integers",count);
}

```

Figure 3 Random Number Benchmark Comparison

Compiler	Execution Time	Total Bytes
Duggers C V2.1	24.6 sec	13864
Telecon C	31.2 sec	5613

Editor's Note: Since this was set we were informed that Telecon systems has decided not to support OS9 at this time. Interested users in an OS9 version should contact Telecon direct.

DMW - - -

SIMPLE WINCHESTER INTERFACE

The following software & hardware can be used as a guide to connect a Winchester hard disk drive to a 6809 system. The system consists of a Percom SBC-9 MPU, a Boaz 64k ram, a Western Digital WD1000 controller & a Shugart SA1002 5 meg drive. (The last two items are available from computer Dynamics for about \$1100.) The entire system- cpu, drive, controller, 64k ram, back plane & power supplies cost less than \$1650! The Winchester controller connects directly to the Percom's buffered I/O. A description of the software is:

HARDFORM- Formats the disk, links, checks for errors & sets up the system information sector & directory.

FDRIVERS- The disk driver & terminal I/O.

PUTLDR- Writes whatever (the loader) is at \$C100-\$C1FF to track 0, sector 1.

HLOADER- Append this to TSC's loader, assemble, GET it and use PUTLDR to put it at track 0, sector one.

HBOOT- Boots FLEX from side 0.

CFAST- A program written in C which prompts the user for an interleave number, checks the disk for CRC errors and reports them. (useful for floppies too.) This program is not necessary to get the system running.

Selecting drive 0 selects side 0 of the SA1002 & access to drive 1 selects side 1 of the Shugart. IE:

TYPE	DRIVE	SIDE	:	FLEX DRIVE
WINCHESTER	0	0	:	0
WINCHESTER	0	1	:	1
FLOPPY	1	0	:	2
				NOT USED IN THIS VERSION

The requirements of the power supplies for the controller are:

+5 volts-

3 amps for the controller & 3 amps for the each 5 meg drive used. The current varies by about two amps while stepping, so this supply should have short lengths of 14 wire.

+24 volts-

3 amps max. Shugart says 24 volts +/- 3 volts. Although this drive may work at 21 volts, it will not tolerate more than 300mv of ripple. This supply must be very well regulated as the very high speed stepping rates cause high peak currents.

-8 to -15 volts-

The drive has an on board regulator, so get this from the host along with the buss.

Headaches:

The first problem occurred when I attempted to do a high speed restore. Normally during a seek the drive will accelerate & decelerate to the desired track. During a restore the drive does not know in advance where the destination is and cannot decelerate. During a restore a slower stepping rate must be used to prevent the drive from crashing past the opto-detector. The drive does a power-up restore & the controller does it's own error recovery, so one seldom needs to restore the drive.

A sloppy 24 volt supply caused a few seek errors & a lot of head scratching.

The only other problem was with the drive itself. There was a bit of solder mask on the edge connector foil which caused some problems until I scraped it off.

Because this system has never made an error I do not verify any writes, but I do a disk test every few days. (CFAST will test the disk in 35 seconds) A write verify requires a complete disk revolution before another sector can be written, resulting in a very slow write time.

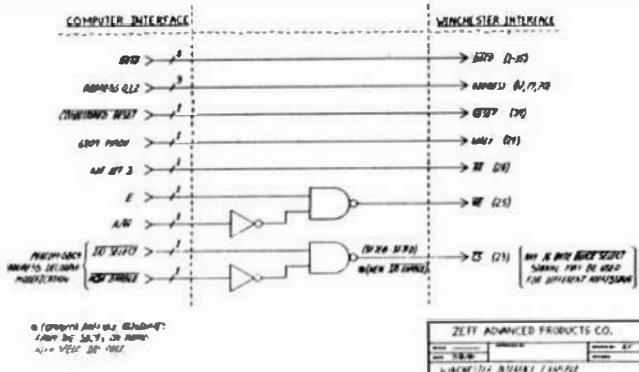
The above software is available on 5" or 8" disk for \$15. An SS-30 interface card (unpopulated) is available for \$25

DIRECTORY OF DRIVE NUMBER 3
DISK: WINCHEST #1 CREATED: 19-JUL-82

FILE#	NAME	TYPE	BEGIN	END	SIZE	DATE
1	README	.TXT	01-01	01-02	2	19-JUL-82
2	COVER	.TXT	12-06	13-08	13	20-JUL-82
3	PUTLDR	.TXT	08-06	08-09	4	19-JUL-82
4	HARDFORM.TXT	05-08	08-05	28	19-JUL-82	
5	HLOADLIB.TXT	08-0A	09-04	5	19-JUL-82	
6	HBOOT	.TXT	09-05	09-09	5	19-JUL-82
7	CFAST	.TXT	09-0A	0E-09	50	19-JUL-82
8	CFAST	.CMD	0E-0A	10-09	20	19-JUL-82
9	CFASTTST.TXT	10-0A	12-05	16	19-JUL-82	

FILES=9, SECTORS=143, LARGEST=50, FREE=197

Robert Zeff
 Zeff Advanced Products Corp.
 2135 Stone Ave.
 Modesto, Ca. 95351
 (209) 577-4268



Editor's Note: This was submitted by Bob Zeff as a follow up to the advertising of Computer DYNAMICS, Greer, S.C., last month. Also see their advertising this issue.

The interface drawing and a copy of the directory of the disk with the software, as received, are shown here. Due to space requirements, it is impossible to run the complete source programs as an article. I therefore recommend that if you are interested in this project, then you might consider ordering the information (source and binary) direct from Bob Zeff, address as above.

DMW - - -

SPEAK & SING

Better than a year ago we received, for review, the Speech Systems Speak 'N' Sing 2 synthesizer board for the S30 bus. Due to a possible mix-up, on our part, the review of this product is just now being published. For this we apologize!

We have tested this board in both 1 and 2 mhz systems, both 4 and 16 byte address configurations and it and all the supplied software (which there is a bountiful supply) worked without error.

The heart of the system and the most expensive is the SC-01 Speech Synthesizer (about half the cost of the board) which sells for \$219.95 assembled and tested with manual and diskette containing all the necessary software to program and operate the board, either for speech or music. Two additional music and sound effect diskettes are available with single and 4 voice music selections as well as some sound effect programs.

The board as received is addressed (software) to function in slot #2 of the S30 bus position. If the board is placed in any other slot there are two ways in which it can be accessed. First, each time you call a binary program it prompts for the I/O board slot, this is to be answered with the port #. Second, most all programs have included the source file. This allows the user to change the port address in source and then assemble the binary file. Of course programs running in TSC Extended BASIC need only the port assignment changed in the BASIC source. We found that all of the BASIC programs furnished use line #120 as the port assignment line. Most binary programs have the port address at either \$C11D or \$02B1.

BASIC

120 PO=HEX("E020") : REM PORT ADDRESS

change to

120 PO=HEX("E0XX") : REM 'XX' is slot address

MANUAL

The users manual furnished is very complete. It starts out by explaining some hardware considerations that may be necessary on some of the older Standard S30 Bus computers. In fact we know of one user who after installing the simple capacitor fixes shown in the manual discovered that a lot of previous "glitches" went away.

The manual consists of nearly 60 pages of detailed instructions on programming the board. This brings us to an important program furnished that should be explained at this point.

SSEDITOR

The SSEDITOR is a special program (furnished on the supplied diskette) that allows fast and efficient programming of the board. It is referred to as a 'Phoneme' editor. An 800 word dictionary is also supplied. This dictionary allows the immediate development of words, sentences and other speech functions and is accessed automatically by the editor. The dictionary being a standard ".TXT" file may be amended as necessary by the user. When entering the editor the port address of the board may be indicated by answering the "PORT?" prompt by either the port number or the hex address of the board assigned port. Having answered the port query the editor comes up in the "HELP" page mode, this mode can be recalled as required. Indicates the following commands

'up arrow' ↑	Enter Command Mode
+ CMD	Exec FLEX command
A	Enter Append Mode
C	Clear Buffer, enter Append
Mode	
D #	Delete Phoneme #XXXXX
E	Exit to FLEX
G NAME	Get Disk File
H	HELP Listing
I # PH	Insert Phoneme(s) behind #
K	Key Words Display
L	List Phoneme Buffer
O MSG	Output Message to Printer
P	Print Phoneme Buffer on
Printer	
R	Remove Inflections from Buffer
S NAME	Save File to Disk
T (1,2,3,4)	Talk Out Buffer
V	Vocabulary DEMO (esc):

The "up arrow" serves as the prompt in the command mode, where most of the programming is done. The commands available are then called as shown above. For example if the "V" command is called then the system speaks all the words (800) in the dictionary. This alone requires about 7 minutes of listening. The "ESC" key will abort this at any time. The editor establishes a buffer on the disk assigned as the work disk. Here is where all the words that are either used from the dictionary or written by the user are held for testing, editing, etc. Example: If we should enter the APPEND mode by typing "A" then we could append, to the end, whatever is in the buffer.

'THIS
 'IS
 'A
 'TEST

Would be appended in the buffer. The " " is inserted before each word to tell the editor that the

text is a word and not phoneme code. If the words (any or all) are in the editor they would be used in their phoneme coding but displayed in word form. If any of the words are NOT in the dictionary then the user is informed "NOT IN DICTIONARY". At this point the user will code the word in, in phoneme code. To exit the APPEND mode type in (up arrow)T and the buffer will be output as speech. One other important aspect of this type programming is that the words are not automatically entered into the buffer with spaces between words or sentences. This is accomplished as:

'THIS*
'IS*
'A*
'TEST*

The "*" indicates that spacing, normally about 47 milliseconds in time, is to be inserted between each word. Also the following could have been typed in:

'THIS IS A TEST.

It would be reproduced as the example above. One other nice function is that the ":" is noticed by the program and a 185 millisecond pause is inserted, knowing that the pause between sentences is longer than between words.

Additionally the actual phoneme could have been typed in, of course necessary if the word is not in the dictionary or you desire a different inflection to the word; i.e., Texan, Southern, Yankee, etc. The normal dictionary speaks 'mid-western American', whatever that is ya-all. An example is the word AMERICA:

UH1 M EH1 R I2 K UH1
(AMERICA - Phoneme)

To add some thing beside 'mid-western American' we would add inflection levels (1-4). They would be entered:

2/UH1 2/M 3/EH1 2/R 2/I2 1/K 1/UH1

The slash character is optional, but it helps readability.

The "D" delete command allows a range specified such as 20-45, meaning that all words (actual or phoneme) between the 20th to the 45th are to be deleted. The "K" command causes the "Keyword Index" page to be displayed. Example; the phoneme mnemonic "B" sounds like the "B" in BAT or RUB. Believe me this is a real help and makes typing code a lot easier. The index is fairly extensive.

All the other commands are fairly self explaining with the exception of the "T" TALK command. The "I" command allows the buffer to be spoken by the system. Also the user may designate a certain point, in the buffer, at which the system should start speaking. Example; T26, means to start speaking with the 26th word in the buffer. Should the user type T2 26 then the words starting at the 26th word would be spoken but, the "2" scale inflection would be used. Inflections that have other coded inflections will still be spoken at the "2" scale. The inflections are programmed so that the higher the inflection number (1-4) the lower the inflection.

SPEECH SYNTHESIS

Needless to say that we are not going to cover the entire subject of "speech synthesis" as it would require far more pages than are in this issue. However, I will touch on a few important aspects of this subject.

There are several ways in which speech may be programmed into a computer. The "waveform" method was one of the first used. The voice waveform is

constructed by actually recording the analog speech and then processing it by A/D methods and storing it in memory. This system is by far the best quality and is in fact used in digital recordings which are becoming the rave among music buffs. The drawback to this is that the method is very expensive in the utilization of memory and despite many different compression methods devised it still uses far more memory than the other two major schemes.

Another method is referred to as "linear predictive coding" and is used by the TI "Speak and Spell" toy. The principle nature of this method takes advantage of the fact that human speech is very redundant. There are a few major waveforms for human speech, linear predictive coding removes this redundancy and uses only the critical human waveform data. The primary disadvantage is that this method requires hardware that limits the vocabulary, as each word (as the system explained above) must be actually prerecorded and then processed by an A/D - D/A system. Most predictive systems are coded into ROM and contain many standard words. However, the cost is very high, per word, for the coding of special ROMs, something on the order of several hundred dollars or more per word, for custom programming. This renders predictive coding schemes too expensive for the average micro-computer user.

This brings us to the third method, which is the scheme used by this board. This is by the "Phoneme" method. The phoneme being an isolated speech sound requires very little data to produce intelligent speech. Also the vocabulary becomes almost limitless and is, for all practical purposes, limited only by the desires of the user and digital storage capacity available on the host computer system. Cost wise this is the most effective method of generating speech. The heart of this board is the SC-01 speech synthesizer chip.

A short but useful and interesting (if you are into speech synthesizing) section is included in the manual. This section goes into enough detail concerning the different aspects of "phoneme programming" to give the user a feel for phoneme coding.

Basically the board is capable of producing 64 different phonemes. These in turn are divided into 6 categories:

VOICED
VOICED FRICTIONAL
VOICED STOP
FRICTIONAL STOP
FRICTIONAL
NASAL

Example; VOICED phonemes are spoken using mainly the vibrations of the vocal chords. Phonemes that are produced by an articulator, such as the teeth, are known as FRICTIONAL. The phoneme "F" being an example. A special program is included "PHNGROUP" that speaks the different phoneme groups. Words are developed by stringing phonemes together. The beginner will soon find that by listing out the words in phoneme code and by listening to the programs provided, he/she will soon be coding phonemes quite proficiently. I do not mean to imply that it is "idiot simple" but anyone who can program in assembler, BASIC or any other language can soon catch onto phoneme coding. If I can, anyone can!

A normal coding session consists of first determining if the desired words are in the dictionary (actually you will be informed if they are not). Say out loud each word as it is being coded. Repeat as necessary until you begin to "feel" what the word sounds like. This requires a little getting used to at first, also other people (as well as most dogs and cats) will, at first, think you have suddenly become a stroke victim or something, vainly trying to communicate, however, a short explanation on your part (in plain, not phoneme, language) should clear

the air, more so with other humans rather than pets. My dogs still sit up and give me that special look each time I get into a coding session, fact is I honestly believe that they now understand some words in phoneme sound better than in my normal English(?) .

Once you have what you feel is the proper code for the word then you can have the editor speak it back, just in case. As strings of words are developed and played back for approval it will be discovered that things are "really" getting easier. Because of the extensive possibilities allowed by the programs furnished, I will not attempt to cover coding any deeper, however, it should be pointed out that coding in phonemes is actually much simpler than it first appears. Needless to say, the 800 words in the dictionary you receive (as well as those you can add after you are satisfied that they are correct) go a long way in making coding a simple task, once the basics are understood.

DEMO PROGRAMS

The diskette furnished has over 300 sectors of programs, including the SSEDITOR. Many of these are music as well as speech. In fact a large portion of the manual is devoted to programming music (again with an editor "MUSICED") as well as speech in assembler and TSC Extended BASIC". Also included are some neat games and such. One called MATHTUTR.BAS keeps my grandkids enthralled by the hours. It is a simple program that gives the choice of addition, subtraction, division and multiplication. The user is allowed to limit the range of numbers so that it can be enjoyed by the younger as well as the more advanced. It presents the problem on the CRT screen and also speaks the problem at the same time. If the answer is correct a congratulation type reply is given by the computer, of which there are several. If the answer is not correct a firm but polite reply from the computer is given to the player and another attempt is called for. The computer being able to speak holds their attention far longer than just a plain CRT display. I honestly feel that speech could do more for CAI "Computer Assisted Instruction" than any one other single aspect of the entire learning process, as applies to CAI.

Other programs furnished are HI-LO (game) Waveform Speech (requires a separate D/A converter JPC type) this as explained previously is by far the highest fidelity method available, but is hard on memory. Also are some music demonstrations, such as

MINUET IN G	4 Voice
REGARDS TO BROADWAY	4 Voice
REGARDS TO BROADWAY	1 Voice
DARLING CLEMENTINE	1 Voice
TOP OF OLD SMOKEY	1 Voice

The music editor makes programming music easy. The music editor furnished with the board is a single part editor. A 4 part editor is available but we did not receive it for review so I can not tell you at this time how it actually works. Even the single voice editor allows "stereo" music, however two boards or one of their SING "N" STEREO boards are required. As this review is done on the SS-1 board, again I can not tell you much about the others.

A special program "PLAY" is included, this allows all binary music to be played as a command function in FLEX". Also included are several "sound effect" programs; STORM, SIREN, MORSE, PLANE, PHASOR. Some in assembler, with source or BASIC.

Additional programs furnished allow speech data developed in the SSEDITOR and saved to disk to be spoken by the computer by the TALK command. Others are TALKFIFO which uses a FIFO buffer of 64 or less phonemes, the entire string can be stored in less than 1 millisecond. This frees up processor time.

TALKIRQ allows the system to process speech in an

interrupt system. The manual includes instructions on hardware configuration for the board's PIA.

TALKVARY allows words to be spoken and their speed controlled for demonstration purposes.

TALKFILE allows the users to listen to a phoneme file previously saved out of the editor. In other words, once a speech file is saved to disk it can be spoken by the computer by simply calling TALKFILE and the file.

SETSPEED allows close calibration of phonemes.

ALLPHNS reproduces all 64 phonemes.

HARDWARE

The SS-1 board has full capability for speech, music and sound effects. Actually it is two circuits. One a digital to analog converter (DAC) is driven by the A side of a PIA, and the other is a phoneme speech synthesizer driven by the B side of the PIA.

The output of the DAC ranges from 0 to 5 volts (reference and supply voltage). It is considered an 8 bit converter as it is attached to 8 lines of the PIA, thus allowing 256 different voltage levels in the range 0-5 volts. As mentioned previously "waveform" speech will require an additional AD converter, such as the JPC AD-16 unit (see JPC advertising - 68 Micro Journal). The FIFO buffer is composed of two ICs 3341 64 byte FIFO, the phoneme chip an interface circuit and the driver (PIA). The FIFO buffer holds 8 seconds of speech. Additional time can be had by using the computer's memory and the interrupt programs provided.

All 8 lines of the "B" side of the PIA are used to drive the speech synthesizer. Six of these lines encode one of the 64 phonemes. The remaining two encode the inflection scale (1-4).

The remainder of the circuitry does the audio summing and amplification (2 watts nominal).

Three pots are mounted on the top of the board for easy access, they control: volume, balance and the master clock frequency of the speech synthesizer.

A five pole DIP switch is mounted on the board to enable or disable several functions of the board. The functions affected are the D/A portion as to its control of the speech speed. This switch position allows simultaneous play back of speech and music. The remainder of the switch controls the interrupt line of the host computer system, one for each side of the PIA. Also the switch allows the PIA to control the NMI line of the computer for both the A and B side.

ADDITIONAL SOFTWARE

Two other disks were included in our review package. They both sell for \$29.95 each and contain games, music (4 voice, which is very pleasing) and special sound effects. Source is included for both binary and BASIC programs. They are:

SF-1 Optional Software

Consisting of 25 different programs.

SF-2 Optional Software

Consisting of 18 additional programs.

While space constraints will not allow a detailed discussion of the programs contained on the two additional diskettes it is our hearty suggestion that they be purchased with the board as they not only have a wealth of programs but the source listings are valuable in learning the more advanced processes in fully using

the system.

Additional information concerning the SS-1 SPEAK "N" SING board can be secured from:

SPEECH SYSTEMS
38 W. 255 Deepth Road
Batavia, IL. 60510
(312) 879-6880

The price, Assembled and Tested, is \$219.95.

The quality of both the software and hardware is above average. We have run this system now for over a year and have not experienced any soft/hard failures. Again I regret that this review was delayed. However, it did allow us to include some functions that were not in our original package and it attests to the durability of the product.

Staff - 68 Micro Journal --

6800 to 6809

Converting 6800 Assembler Language
to 6809 Assembler Language

by E. M. Pass, Ph.D.
Computer Systems Consultants, Inc.
1454 Latta Lane, Conyers, GA 30207
Telephone Number 404-483-1717/4570

GENERAL

The conversion of 6800/1 assembler language programs to 6809 assembler language programs is an important topic. The discussion below attempts to structure this process and provide assistance to those attempting to do so. It will be divided into the following conversion phases:

basic conversion;
non-basic conversion;
optimization.

BASIC CONSIDERATIONS

Most 6800/1 mnemonic instructions have an identical 6809 symbolic representation and interpretation. This is to be expected, since the 6809 is intended to be generally upward-compatible from the 6800/1. These instructions thus require no further attention in terms of the basic language process.

A few 6800/1 instructions have an identical 6809 representation but non-identical interpretation. This may present difficulties in terms of the non-basic conversion considerations. These instructions should be recognized during the basic conversion process so that the problems they create may be better addressed during the later conversion process. They are the following:

ASR,LSR,ROR	6800/1 affects V flag
CMP,NEG,SBC,SUB	6800/1 clears H flag
SWI	6809 stacking order is different
TST	6800/1 clears C flag

The remaining 6800/1 instructions have different 6809 symbolic representations, or none at all. Depending upon the circumstances, it may be desirable to provide less than identical 6809 interpretation for certain instructions. These instructions are as follows:

ABA	PSHS B
ASLD	ADDA ,S+
CBA	ASLB ROLA
	PSHS B CMPA ,S+
CLC	ANDCC \$FE
CLI	ANDCC \$EF
CLV	ANDCC \$FD
CLZ	ANDCC \$FB
CPX	CMPX _
DES	LEAS -\$01,S
DEX	LEAX -\$01,X
INS	LEAS \$01,S
INX	LEAX \$01,X
LDAA	LDA _
LDAB	LDB _
LSRD	LSRA RORB
PSHA	PSHS A
PSHB	PSHS B
PSHX	PSHS X
PULA	PULS A
PULB	PULS B
PULX	PULS X
SBA	PSHS B SUBA ,S+
SEC	ORCC \$01
SEI	ORCC \$10
SEV	ORCC \$02
SEZ	ORCC \$04
STAA	STA _
STAB	STB _
TAB	TFR A,B TSTA
TAP	TFR A,CC
TBA	TFR B,A TSTA

TPA	TFR CC,A
TST	TST ANDCC \$FE
TSTA	TSTA ANDCC \$FE
TSTB	TSTB ANDCC \$FE
TSX	TFR S,X
TXS	TFR X,S
WAI	CWAI \$FF

Note that the TST instruction is included in this table to indicate its 6809 symbolic representation. The other 6800/1 instructions with identical 6809 representations are not normally provided additional processing.

NON-BASIC CONSIDERATIONS

The conversions discussed in the previous section were generally of a rather clerical nature. For many programs, no further work is necessary to complete the conversion. However, due to non-identical 6809 interpretations of some of the 6800/1 instructions, the basic conversions are not sufficient in many cases, and more complex conversion procedures must be used.

These non-identical interpretations arise in several manners. One is in the non-identical instruction interpretations of the following instructions:

ASR, LSR, ROR	6800/1 affects V flag
CMP, NEG, SBC, SUB	6800/1 clears H flag
CPX	6800/1 sets only Z correctly
SWI	6809 stacking order is different
TSX	6800/1 sets X to S+1
TXS	6800/1 sets S to X-1

Although the 6809 interpretation of the 6800/1 instructions could be made identical with the 6800/1 interpretation, this is not usually done. The extra 6809 code in all cases is not considered worth the reduction in problems in a small number of cases, nor is it necessarily considered desirable. Even if the interpretations were made identical, not all of the conversion problems would be solved, due to architectural differences between the processors.

The non-basic conversion procedures generally involve re-debugging the converted code, looking for situations in which the condition code register does not contain the expected contents. the stack pointer is off-by-one, etc. Since most of these situations are associated with certain instructions or sequences of instructions, they should be generally easy to locate.

SPECIFIC PROBLEM AREAS IN CONVERSION

There are several areas of concern in the conversion which are not necessarily associated with certain instructions or sequences of instructions, and thus may cause problems in subtle manners which may be relatively difficult to locate. Several areas are discussed below.

The format of the condition code registers on the 6800/1 and 6809 are identical except for the 6809 E and F flags, the high-order two bits in the register. These bits are always 1 on the 6800/1, but not on the 6809. Either assuming that the bits are 1 or modifying them may cause processing errors.

The stacking order during interrupt and SWI processing differs on the two classes of machines. On the 6800/1, the stacking order is as follows (lower to higher addresses):

CC,B,A,XH,XL,PCH,PCL

whereas, on the 6809, the stacking order is as follows:

CC,A,B,DP,XH,XL,YH,YL,UL,PCH,PCL

In addition to the five additional bytes pushed onto the 6809 stack, the order of the A and B registers is reversed from the 6800/1.

The S register on the 6800/1 points to the memory address one less than the last item pushed onto the stack, whereas the S register on the 6809 points to the memory address of the last byte pushed onto the stack. This may cause problems with the TSX and TXS instructions and with accessing parameters to subroutines. Interrupt handling code must take into account both the 6809 stacking order and the fact that the S register points to the top of the stack, not one location below.

External addresses, such as for the I/O and operating system, will probably be different between the 6800/1 and 6809 implementations.

The number of bytes required to express 6809 programs is normally larger than the number required on the 6800/1. This may cause difficulties in attempting to fit programs into specific sizes, such as in PROM's. It also may cause assembly errors due to out-of-range branches, which may be corrected by using the 6809 long branch instructions as required.

OPTIMIZATION OF 6809 CODE

Because of the larger instruction set and choices of addressing modes on the 6809, many 6800/1 programs may be significantly improved once converted to the 6809. Generally, this optimization process is performed after the converted program has been successfully debugged on the 6809. It can, however, be performed during the conversion process. The discussion below addresses some of the most common, easiest optimization procedures for converted 6800/1 programs.

Convert contiguous sequences of LEAX or LEAS instructions into the equivalent single instruction. On the 6800/1, the easiest manner in which to increment or decrement the X or S registers by a small amount is sometimes to code multiple DES, DEX, INS, INX instructions. After conversion, these become 6809 LEAS or LEAX instructions and may be combined. The relative effect on the condition-code register flags will generally be zero.

Combine LEAX or LEAS instructions with nearby or adjacent indexed instructions when the effect is a pre-decrement or post-increment index operation by one or two. The effect on the condition-code register flags must be considered, as the index modification will then no longer affect the condition-code register.

Combine sequences of instructions involving the A and B registers into the equivalent sequence involving the D register, when possible. Often on the 6800/1, load, store, compare, add, subtract, and other operations operate on 16-bit fields between memory and the A and B registers. On the 6809 these 8-bit operations can often be replaced by true 16-bit operations between memory and the D register. The condition-code register contents will almost certainly be different after the combination of instructions and must be considered.

Combine contiguous sequences of PSHS or PULS operations into a smaller number of PSHS or PULS operations, when possible. Regardless of the stated

order of registers in the 6809 assembly representation of an instruction, registers are always pushed and pulled (in a given 6809 instruction) to maintain the stacking order described above, although not necessarily all of the registers will be stacked or unstacked.

A sequence of PULS instructions may be combined with a following RTS instruction by appending ",PC" to the end of the last resultant PULS instruction. A pull of a register followed immediately by a push of the same register may often be replaced by a load of that register from the top of the stack (,S), although the condition-code register contents will be modified by the load, but not by the pushes and pulls. A push of a register, followed by a pull of a different (but same size) register may be replaced by a transfer from the first register to the second, without changing the contents of the condition code register.

Look for longer sequences of instructions, especially those involving movement or comparison of contiguous bytes in memory, which may be replaced by 6809 code which uses the Y and U registers to avoid extra saves and restores of the X register. Especially in time-critical areas, this class of change has the potential for more substantial improvement of 6809 code than does the other areas, although it may be more difficult.

As is the case with any program change, the optimized program must be thoroughly retested.

SUMMARY

The discussion above attempted to structure this process and provide assistance to those attempting to do so. It was structured in the following manner:

basic conversion;
non-basic conversion;
optimization.

CONTINUED FROM LAST MONTH

Home Acct Prog

Part III

ERNEST STEVE WATSON
11701 ST. CHARLES BLVD.
LITTLE ROCK, ARKANSAS 72211

OR

F. DALE BRADY
7729 BRADELY DRIVE
LITTLE ROCK, ARKANSAS 72209

```
0 REM THIS PROGRAM READS IN FROM A DATA FILE
      INFORMATION
20 REM CON ERNING THE PROPOSED BUDGET FOR ALL INCOME
      AND
30 REM EXPENSE ACCOUNTS DURING A ONE YEAR PERIOD. IT
40 REM THEN COMPARES A PRORATED BUDGETED AMOUNT WITH
50 REM THE ACTUAL EXPENSES INCURRED YEAR-TO-DATE,
      PRINTING
60 REM THE CURRENT DIFFERENCE AND THE PROJECTED
      AMOUNT
70 REM OF SUCH DIFFERENCE FOR THE YEAR.
75 DIGITS 5,0
80 PRINT "BUDGET PROGRAM"
90 PRINT
100 PRINT "ENTER THE NAME OF THE GENERAL LEDGER FILE"
110 PRINT "FROM WHICH THE COMPUTATIONS WILL BE MADE"
120 INPUT "FOR EXAMPLE 'GL10B1.DAT'",GL$
130 OPEN OLD GL$ AS 1
```

```
140 PRINT
150 PRINT "ENTER THE NAME OF THE BUDGET DATA FILE"
160 INPUT "FOR EXAMPLE 'BUDGETB1.DAT'",BF$
170 OPEN OLD BF$ AS 2
180 PRINT "ENTER THE EXPIRED AMOUNT OF THE YEAR TO
      DATE"
190 INPUT "AS A TOTAL OF DAYS",P
200 P=P/365
210 ON ERROR GOTO 600
220 INPUT #2,A,A$,B
230 X=X+1
240 GOTO 220
250 CLOSE 2
260 OPEN OLD BF$ AS 2
270 DIM A(X),A$(X),B(X)
280 FOR I=1 TO X
290 INPUT #2,A(I),A$(I),B(I)
300 NEXT I
310 CLOSE 2
320 ON ERROR GOTO 620
330 DIM B1(X)
340 INPUT #1,A1,A1$,B1
350 IF A1<400 THEN GOTO 340
360 FOR I=1 TO X
370 IF A1=A(I)THEN B(I)=B(I)+P:B(I)=B(I):GOTO 340
380 NEXT I
390 CLOSE 1
400 PRINT "A/C":TAB(4);
410 PRINT "ACCOUNT":TAB(25);
420 PRINT "BUDGET":TAB(32);
430 PRINT "ACTUAL":TAB(39);
440 PRINT "OVER/+":TAB(45);
450 PRINT "PROJECTED"
460 PRINT "NO.":TAB(4);
470 PRINT "NAME":TAB(21);
480 PRINT "AMOUNT":TAB(32);
490 PRINT "AMOUNT":TAB(39);
500 PRINT "UNDER":TAB(45);
510 PRINT "FOR YEAR "
520 PRINT
522 V$="####"
524 Z$=CHR$(92)+"          "+CHR$(92)
530 FOR I=1 TO X
535 IF A(I)<400 THEN GOTO 580
537 IF B(I)<0 THEN B(I)=B(I)+(-1)
538 IF B(I)>0 THEN B(I)=B(I)+(-1)
540 PRINT A(I):TAB(4);
550 PRINT USING Z$,A$(I):TAB(25);
560 PRINT USING V$,B(I):TAB(32);
565 B4=B4+B(I)
570 PRINT USING V$,B1(I):TAB(39);
571 B2=B2+B1(I)
572 PRINT USING V$, (B1(I)-B(I)):TAB(45);
573 B6=B6+(B1(I)-B(I))
574 PRINT USING V$, ((I/P)*(B1(I)-B(I)))
576 BB=BB+((I/P)*(B1(I)-B(I)))
580 NEXT I
582 PRINT
583 PRINT TAB(5); "TOTALS";
584 PRINT TAB(25);
585 PRINT USING V$,B4:TAB(32);
586 PRINT USING V$,B2:TAB(39);
587 PRINT USING V$,B6:TAB(45);
588 PRINT USING V$,BB
590 END
600 IF ERR<0 THEN ON ERROR GOTO 0
610 RESUME 250
620 IF ERR<0 THEN ON ERROR GOTO 0
630 RESUME 390

0 REM BALANCE.BAS
15 REM 1/11/82
20 CL$=CHR$(27)+"E"
30 MZ=60
40 PRINTCLS
50 PRINT:PRINT
60 REM GET YI=YEAR,PS=GENLEG MONTH,MS=CURRENT MONTH
70 OPEN"1.YEAR":AS1:GET#1,RECORD1
80 FIELD#1,2,ASTNS,2ASCYS,1ASCMS,1ASPM$,40ASCNS$
90 YI=CVT$%(CY8):PS=PM$;MS=CM$;NS=CN$
100 CLOSE1
```

```

110 REM GET SIZE OF GENLEG FILE AND DIM VAR.
120 OPENOLD"1."+P$+"."GL" AS1
130 GET#1,RECORD1:FIELD#1,2ASZ$:X%=CVT$(Z$)
140 DIMNZ$(X%),A$(X%),A(X%)
150 REM READ IN GEN LEG
160 GET#1,RECORD1:6010180
170 GET#1
180 FORSZ=0TO7
190 FIELD#1,SZ*30ASZ$,2ASGN$,20ASGM$,8ASGT$
200 IFGM$="*DRCVT$(GN$)=0THEN240
210 IZ=12+1
220 NZ$(IZ)=CVT$(GN$):A$(IZ)=6M$;A(IZ)=CVT$(6T$)
230 IFIZ=IZTHEN260
240 NEITSZ
250 GOTO170
260 PRINTCL$ 
270 PRINT:PRINT
280 PRINTTAB(25);N$ 
290 PRINT:PRINTTAB(125);M$;" 1,;"YZ
300 PRINT:PRINT
310 PRINT"ASSETS"
320 PRINT
330 FORIZ=1TOIZ
340 IFNZ$(IZ)>=200THEN390
350 IFA(IZ)=0THEN380
360 GOSUBB70
370 TA=TA+A(IZ)
380 NEXTIZ
390 REM
400 A$="TOTAL ASSETS":A=TA
410 GOSUBB90
420 GOSUB900
430 PRINT:PRINT"LIABILITIES"
440 PRINT
450 FORIZ=IZTOIZ
460 IFNZ$(IZ)>=300THEN510
470 IFA(IZ)=0THEN500
480 GOSUBB70
490 TL=TL+A(IZ)
500 NEXTIZ
510 A$="TOTAL LIABILITIES":A=TL
520 GOSUBB90
530 PRINT:PRINT"EQUITY"
540 PRINT
550 FORIZ=IZTOIZ
560 IFNZ$(IZ)>=400THEN610
570 IFA(IZ)=0THEN600
580 GOSUBB70
590 TE=TE+A(IZ)
600 NEXTIZ
610 A$="TOTAL EQUITY":A=TE
620 GOSUBB90
630 A$="TOTAL LIAB & EQUITY":A=TL+TE
640 GOSUB900
650 PRINT:PRINT:FORI=1TO(W%-3):PRINT" ";:NEXTI
660 PRINT:PRINT"EXPENSE"
670 PRINT
680 FORIZ=IZTOIZ
690 IFNZ$(IZ)>=500THEN740
700 IFA(IZ)=0THEN730
710 GOSUBB70
720 TI=TI+A(IZ)
730 NEXTIZ
740 A$="TOTAL EXPENSES":A=TI
750 GOSUB900
760 PRINT:PRINT"INCOME"
770 PRINT
780 FORIZ=IZTOIZ
790 IFNZ$(IZ)>=600THEN840
800 IFA(IZ)=0THEN830
810 GOSUBB70
820 TI=TI+A(IZ)
830 NEXTIZ
840 A$="TOTAL INCOME":A=TI
850 GOSUB900
860 END
870 PRINTTAB(1234567890123456789)
880 RETURN
890 PRINTTAB(3);A$;TAB(35)::PRINTTAB$'800,000.00',A$(IZ),A(IZ)
900 RETURN
910 PRINTTAB(10)::FORX=1TO LEN(A$):PRINT" ";
920 :NEXTX:PRINT
930 PRINTTAB(10)::FORX=1TOLEN(A$):PRINT" ";
940 :NEXTX:PRINT
950 RETURN

0 REM EDITGL.BAS
20 CL$=CHR$(27)+"E"
24 PRINTCL$ 
25 PRINT:PRINT:PRINT
26 PRINT"THIS PROGRAM CAN BE USED TO CHANGE ACCOUNT"
27 PRINT"NAME OR NUMBER, ALSO LIST ACCOUNTS"
30 W=60
40 REM GET Y=YEAR,GL$=GENLEG MONTH,M$=CURRENT MONTH
50 OPENOLD"1.YEAR"AS1:GET#1,RECORD1
60 FIELD#1,2ASTN$,2ASTY$,3ASTM$,3ASTS$,40ASN$ 
70 N$=N$ 
80 Y=CVT$(TY$):GL$=T6$:M$=TM$ 
90 CLOSE1
100 REM GET SIZE OF GENLEG FILE AND DIM VAR.
110 OPENOLD"1."+GL$+"."GL" AS1
120 GET#1,RECORD1:FIELD#1,2ASZ$:X%=CVT$(Z$)
130 DIMNZ$(X%),A$(X%),A(X%)
140 REM READ IN GEN LEG
150 GET#1,RECORD1:GOTO170
160 GET#1
170 FORSZ=0TO7
180 FIELD#1,SZ*30ASZ$,2ASGN$,20ASGM$,8ASGT$
190 IFGM$="*DRCVT$(GN$)=0THEN230
200 IZ=12+1
210 NZ$(IZ)=CVT$(GN$):A$(IZ)=6M$;A(IZ)=CVT$(6T$)
220 IFIZ=IZTHEN250
230 NEITSZ
240 GOTO160
250 PRINTCL$ 
260 PRINTTAB(W/2-12);"Edit the General Ledger"
270 PRINT:PRINTTAB(W/6);"This information from ";
GL$;".GL" file."
280 PRINT
290 PRINTTAB(W/4);1. Change account NUMBER"
300 PRINTTAB(W/4);2. Change account NAME"
310 PRINTTAB(W/4);3. List of ACCT#/NAME"
320 PRINTTAB(W/4);4. Return to MENU"
330 PRINT
340 PRINTTAB(W/4);"; YOUR CHOICE (1-4)? ";
A=VAL(INCH$(0)):PRINT
350 IFA(1 OR A>4)THEN340
360 ONAGDT0450,630,800,790
370 REM ADD TO GEN LEG FILE
380 RZ=IZ/8:S$=IZ-(RZ*8)
390 GET#1,RECORDRZ+1
400 FIELD#1,SZ*30ASZ$,2ASGN$,20ASGM$ 
410 LSETGN$=CVT$(NZ$(IZ))
420 LSETGM$=A$(IZ)
430 PUT#1,RECORDRZ+1
440 RETURN
450 REM CHANGE ACC#
460 PRINTCL$ 
470 PRINTTAB(W/2-8);"CHANGE ACCOUNT NUMBER"
480 PRINT:PRINT
490 PRINT"Enter END to return to MENU"
500 INPUT"Enter Account Number to be changed",ANS
510 IFANS$="END"THEN250
520 NZ$=VAL(ANS):IFNZ$<100 OR NZ$>900THEN
PRINTCHR$(7);"NUMBER OUT OF RANGE":GOTO480
530 FORIZ=1TOIZ:IFNZ$=NZ$(IZ)THEN540ELSENEXTIZ
:PRINTCHR$(7);"THAT ACCOUNT NUMBER NOT FOUND"
:GOTO480
540 PRINT:PRINT"ACCO ";NZ$(IZ);TAB(15);A$(IZ)
550 PRINT:PRINT"IS THIS CORRECT ACCOUNT (Y/N)? ";
A$=INCH$(0):PRINT
560 IFANS$>"Y"THENPRINTCHR$(7):GOTO450
570 INPUT"Enter NEW ACCO (END TO RETURN)",ANS
580 IFANS$="END"THEN450
590 NZ$=VAL(ANS):IFNZ$<100 OR NZ$>900THENPRINT"NUMBER"

```

```

OUT OF RANGE":GOT0570
600 FORIZ=IT0XZ:IFNZ=NZ(IIZ)THEN610ELSENEXTIZ
:GOT0620
610 PRINTCHR$(7);"THAT ACC IN USE":GOT0570
620 NZ(IZ)=NZ:GOSUB370:GOT0450
630 REM CHANGE ACCT NAME
640 PRINTCL$6
650 PRINTTAB(W/2-8);"CHANGE ACCOUNT NAME"
660 PRINT:PRINT
670 PRINT"Enter END to return to MENU"
680 INPUT"Enter Account Name (or Number) to
change",ANS
690 IFANS="END"THEN250
700 NZ=VAL(ANS)
710 FORIZ=IT0XZ:IFNZ=NZ(IZ)ORANS=A$(IZ)THEN720
ELSENEXTIZ:PRINTCHR$(7);ANS;" CANNOT BE FOUND"
:GOT0660
720 PRINT:PRINT"ACCT ";NZ(IZ);TAB(15):A$(IZ)
730 PRINT:PRINT"IS THIS CORRECT ACCOUNT (Y/N)? "
:ANS=INCH$(0):PRINT
740 IFANS<>"Y"THENPRINTCHR$(7):GOT0630
750 PRINT:INPUT"Enter NEW ACCOUNT NAME",ANS
760 IFVAL(ANS)<>0THENPRINTCHR$(7):GOT0750
770 A$(IZ)=ANS
780 GOSUB370:GOT0630
790 CLOSEI:CHAIN"MENU.BAS"
800 REM LIST
810 PRINTCL$6
820 PRINTTAB(W/2-8);"LIST OF ACCOUNTS"
830 PRINT:PRINT"DO YOU WANT PRINTER OUTPUT (Y/N)? "
:ANS=INCH$(0)
840 PRINT
850 IFANS="Y"THENPOKE40972,0:EXEC,"TTYSET,PS=N,NL=25"
860 PRINT"LIST OF ACCOUNTS FOR ";NZ
870 PRINT:PRINT:PRINT
880 FORIZ=IT0XZ
885 IFIZ=ITHEN900
890 PRINTUSING"0000 \234567890123456789\
###,###.##,NZ(IZ),A$(IZ),A(IZ)
900 NEXTIZ
910 IFANS="Y"THENPOKE40972,1:EXEC,"TTYSET,PS=Y,NL=0"
920 PRINT"KIT ANY EY TO RETURN";:ANS=INCH$(0)
930 GOT0250

```

```

0 REM DELGL.BAS
20 CL$=CHR$(27)+"E"
30 NZ=60
40 PRINTCL$6
50 PRINT:PRINTTAB(N/2-16);"DELETE ACCOUNT IN GENERAL
LEDGER"
60 PRINT:PRINT
70 GOSUB700
80 PRINT
90 OPENOLD"1.YEAR"ASI:GET#1,RECORD1
100 FIELD#1,7ASZ$,3ASPM$
110 GL$=PM$
120 CLOSE1
125 PRINT:PRINT"DELETIONS WILL BE TO THE ";GL$;""
GENERAL LEG FILE."
130 REM GET SIZE OF GENLEG FILE AND DIM VAR.
140 OPENOLD"1."+GL$+"." L" AS1
150 GET#1,R CORD1:FIELD#1,2ASZ$:IZ=CVT#1(Z$)
160 DIMNZ(IZ),A$(IZ),A(IZ)
170 REM R AD IN EN LEG
180 GET#1,RECORD1:GOT0200
190 GET#1
200 FORSZ=0TO7
210 FIELD#1,$Z#30ASZ$,2ASGN$,20ASGM$,BASGT$
220 IFGM$="DRCVT$Z(GN$)<100THEN260
230 IZ=IZ+1
240 NZ(IZ)=CVT#1(GN$):A$(IZ)=GM$:A(IZ)=CVT#1(GT$)
250 IFIZ=ITHEN280
260 NEXTIZ
270 GOT0190
280 CLOSE1
290 PRINT:PRINT

```

```

300 PRINT"Enter END to return to MENU"
310 INPUT"Enter Acc# to DELETE ",ANS
320 IFANS="END"THEN500
330 NZ=VAL(ANS)
340 IFNZ(100RNZ)900THENPRINTCHR$(7);"NUMBER OUT OF
RANGE": D0T0310
350 FORIZ=IT0XZ:IFNZ=NZ(IZ)THEN370ELSENEXTIZ
360 PRINTCHR$(7);"ACCOUNT ";NZ;"NOT FOUND (REENTER)"
:PRINT:GOT0300
370 PRINT:PRINT
380 PRINTUSING"000 \1234567890123456789\
###,###.##,NZ(IZ),A$(IZ),A(IZ)
385 IF(A(IZ)<>0)OTHENPRINT:PRINTCHR$(7);"ERROR ACCOUNT
HAS BALANCE AND CANNOT BE DELETED":PRINT"Hit
ANY KEY TO CONTINUE":ANS=INCH$(0):AN$="N":GOT0400
390 PRINT:PRINT"IS THIS CORRECT (Y/N)? "
:ANS=INCH$(0)
400 IFANS="N"THENPRINTCL$6:GOSUB700:GOT0290
410 IFANS<>"Y"THENPRINTCHR$(7):GOT0390
420 PRINT
430 PRINT"ARE YOU SURE (Y/N)? ";:ANS=INCH$(0)
440 IFANS<>"Y"THENPRINTCL$6:GOSUB700:GOT0 90
450 IFIZ=ITHEN480
460 NZ(IZ)=NZ(IZ+1):A$(IZ)=A$(IZ+1):A(IZ)=A(IZ+1)
470 IZ=IZ+1:GOT0450
480 IZ=IZ-1
490 PRINTCL$6:GOSUB700:GOT0 90
500 PRINT"UPDATING GENERAL LEDGER FILE"
510 OPENNEW"1.DUMP.GL"ASI
520 RZ=0
530 FORSZ=0TO7
540 FIELD#1,$Z#30ASZ$,2ASGN$,20ASGM$,BASGT$
550 LSETBN$=CVT#1(NZ(RZ+SZ))
560 LSETGM$=A$(RZ+SZ)
570 LSETGT$=CVT#1(A$(RZ+SZ))
580 IFRZ+SZ=IZTHENPUT#1:GOT0620
590 NEXTIZ
600 PUT#1
610 RZ=RZ+B:GOT0530
620 GET#1,RECORD1:REM ADD FILE SIZE
630 FIELD#1,2ASZ$:LSETZ#=CVT#1(XZ)
640 PUT#1,RECORD1
650 CLOSE1
660 KILL"1."+GL$+"."GL"
670 RENAME"1.DUMP.GL","1."+GL$+"."GL"
680 PRINT:PRINT"LOADING MENU"
690 CHAIN"MENU.BAS"
700 PRINTTAB(12);":INARHNG610"
710 PRINT"IF ACCOUNTS ARE DELETED, TRANSACTIONS FOR"
720 PRINT"DELETED ACCOUNTS CANNOT BE POSTED TO"
GENERAL"
730 PRINT"LEDGER. PLEASE DON'T DELETE ACCOUNTS
UNTIL"
740 PRINT"THOSE TRANSACTIONS RE POSTED."
750 RETURN

```

```

0 REM B LANCE.BAS
30 CL$=CHR$(27)+"E"
40 NZ=60
43 PRINTCL$6
44 PRINT:PRINT
45 PRINTTAB(W/2-7);"Balance Sheet"
50 REM GET YZ=YEAR, P0=GENLEG MONTH, M$=CURRENT MONTH
60 OPEN"1.YEAR"ASI:GET#1,RECORD1
70 FIELD#1,2ASTN$,2ASCY$,3ASCM$,3ASPM$,40ASCN$
90 YZ=CVT#1(TYS$):P$=PM$:M$=CM$:NS=CN$
100 CLOSE1
110 REM GET SIZE OF GENLEG FILE AND DIM VAR.
120 OPENOLD"1."+P$+"."GL" AS1
130 GET#1,RECORD1:FIELD#1,2ASZ$:IZ=C TOZ(Z$)
140 DIMNZ(IZ),A$(IZ),A(IZ)
150 REM READ IN GEN LEG
160 GET#1,RECORD1:GOT0180
170 GET#1
180 FORSZ=0TO7
190 FIELD#1,$Z#30ASZ$,2ASGN$,20ASGM$,BASGT$
200 IFGM$="DRCVT$Z(GN$)=0THEN240
210 IZ=IZ+1
220 NZ(IZ)=CVT#1(GN$):A$(IZ)=GM$:A(IZ)=CVT#1(GT$)
225 PRINTNZ(IZ),A$(IZ),A(IZ)

```

TO BE CONTINUED

ET3400

BASIC FOR A MODIFIED ET-3400/ETA-3400 MICROCOMPUTER

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INTRODUCTION

A number of articles have included directions for interfacing the ET-3400/ETA-3400 microcomputer to SS-50 memory boards. An expanded microcomputer system needs appropriate software. The present article shows how to add a floating point arithmetic BASIC (as opposed to TINY BASIC) interpreter to the ET-3400/ETA-3400 microcomputer system. The version of BASIC that I modified for the ET-3400/ETA-3400 microcomputer is available in a book entitled: *BEST of Interface Age, Volume 1, Software in BASIC*, Carl D. Warren (Ed.), Lithium Press, P. O. Box 92, Forest Grove, Oregon 97160. The book sells for under \$15.00. The BASIC interpreter was written by Robert Uiterwyk and is on pages 240 through 278. I should note that the description of the program in the book has a number of incorrect references to memory locations (especially pages 235 and 236). This should not prove to be a problem because the modifications that are in this article are keyed to the actual program on pages 240 through 278. The program listing does not contain errors.

MEMORY MAP FOR MODIFIED ET-3400/ETA-3400 MICROCOMPUTER

Modifications of the ET-3400/ETA-3400 system do not always produce the same memory map. One has the option of leaving the ET-3400/ETA-3400 Heath/Wintek monitor just above the 4k of RAM in the original system (an inconvenient location for an expanded system), or moving the monitor program to a higher location. If one moves the monitor program, he must burn a new PROM for the modified monitor. I opted to leave the monitor program at its original location and modify the cassette software (such as Uiterwyk's BASIC) to accommodate the inconveniently located monitor program. I also opted to remove the 2k of ROM containing TINY BASIC (which is not necessary when one has a floating point BASIC) and replace this ROM with 2k of RAM. This ROM to RAM conversion has been described in *Popular Electronics* (Wolach, A. H., *Simple memory addition for training computers*, *Popular Electronics*, 1981, 19, 61-62). Uiterwyk's BASIC requires somewhat over 4k of memory. Most of the machine language interpreter program can be placed in the first 4k of the ET-3400/ETA-3400 memory map. The remainder of the program can be placed in the RAM locations previously reserved for TINY BASIC. One could place the last portion of the program in any other consecutive memory locations. A user's BASIC program must be in consecutive memory locations. I started these locations at 4000 (all memory locations are in hex) and installed a 32k SS-50 memory board with consecutive memory locations starting at 4000. The details of my 32k memory addition will appear in one of the 1982 issues of *Popular Electronics*. The '68 *Micro Journal* has

included a somewhat different SS-50 memory addition (Klem, G. H., ET/ETA-3400 to SS50, *68 Micro Journal*, September, 1981, 18-20).

Suppose that one has an ET-3400/ETA-3400 system with RAM in the first 4k locations. Almost all ET-3400/ETA-3400 systems will have RAM in these locations because the unmodified microcomputer system has RAM in the first 4k of memory. Start by entering Uiterwyk's BASIC interpreter (starting on page 240 of the book) until all memory locations through OFF6 are entered. One does not have to enter the entire program at one time. A portion of the machine language can be entered and then saved on cassette until you verify that your most recent (most complete) cassette works properly.

MAKING MONITORS COMPATIBLE

Table 1 shows the changes that have to be made to make the Uiterwyk program compatible with the

Table 1. Making Monitors Compatible

Memory Location	Change to	Contents
0271	16	160C is the Heath/Wintek monitor equivalent of MIKBUG OUT2H (located at EOF8 in MIKBUG)
0272	0C	160A is the Heath/Wintek monitor equivalent of MIKBUG OUT4HS (located at EOF8 in MIKBUG)

0274	16	160A is the Heath/Wintek monitor equivalent of MIKBUG OUT4HS (located at EOF8 in MIKBUG)
0279	18	1865 is the Heath/Wintek monitor equivalent of MIKBUG OUTEEE (located at E1D1 in MIKBUG)
027C	18	18E1 is the Heath/Wintek monitor equivalent of MIKBUG INEEE (located at E1AC in MIKBUG)
07DD	40	Location for beginning of user BASIC program storage
07DE	00	
08E3	14	Location for return to monitor (08E3 and 08E4 would contain EOF3 for a return to MIKBUG)
08E4	00	

Heath/Wintek monitor. The changes assume that the Heath/Wintek monitor remains in its original location. If the monitor is moved to higher memory locations, the new locations must be accessed by the program. For example, one would find new memory locations that correspond to former memory locations 160C, 160A, 1865, 18E1, and 1400. Memory locations 021 and 022 would contain the new monitor equivalent of 16, and 0C respectively. Note that locations 0DD and 07DE contain 40, and 00, respectively. I selected 4000 as the starting address of a user BASIC program. Locations 07DD and 07DE can contain any address as the starting address for BASIC provided this address is above the memory addresses for the BASIC interpreter.

Note that Table 1 gives the Heath/Wintek monitor equivalent of Motorola's MIKBUG monitor routines named OUT2H, OUT4HS, OUTEEE, and INEEE. This information is useful for adapting other software to the ET-3400/ETA-3400 system. Most 6800 software assumes a M KBUG or MIKBUG compatible monitor.

STACK AND INDEX STACK

Table 2 shows the locations for the BASIC stack and Table 2. Stack and Index Stack Locations

Memory Location	Potential Contents
07E7	A0 Stack
07F8	45
07FA	A0 Index Register
07FB	7F Stack
0820	A0
082A	45 Stack
08DA	A0 Patch Routine
08DB	46 for Returning to BASIC
08DD	A0 Stack
08DE	40
08E0	A0 Stack
08E1	08
0CAF	A0 Stack
0CAF	45
0EC7	40 Beginning of
0EC8	00 User Program

index stack. Use these locations if your system has approximately 8k of memory starting at A000. This will make it possible to easily adapt other MIKBUG based software for the ET-3400/ETA-3400 system. MIKBUG assumes scratch pad RAM starting at A000. If your system memory does not extend beyond A000, change the memory locations in Table 2 to locations that are within the range of your memory, but above the range of the memory that will be used for user BASIC programs. For example, memory locations containing A045 in Table 2 could be changed to contain 8045. Similarly, memory locations containing A040, and A008 could be changed to contain 8040, and 8008, respectively.

RELOCATING LAST PORTION OF PROGRAM

Suppose that your system retains the Heath/Wintek monitor program in its original location. The end of the BASIC interpreter can be moved to any memory locations that are below the locations for the start of a user BASIC program. Assume that the locations selected for the end of the BASIC interpreter are in the memory locations formerly reserved for TINY BASIC. One must modify the interpreter by entering the program segments in Table 3. Relocate the end of the BASIC program

Table 3. Changes for Relocated Program

0FC2	7E	1CC4	JMP	0CCED
0FC5	C6	18	NEXT 5	LDA B #\\$18
0FC7	20	02		BRA NEXT6 + 2
0FC9	C6	17	NEXT 6	LDA B #\\$17
0FCB	7E	1CDA	JMP	RELOC
1CC4	BD	0302	JSR	INDX
1CC7	DE	61	LDX	FORNOW
1CC9	EE	00	LDX	0,X
1CCB	BD	02D2	JSR	STOREX
1CCE	DE	61	LDX	FORNOW
1CD0	EE	0E	LDX	14,X
1CD2	DF	36	STX	BASLIN
1CD4	7E	0FBC	JMP	NEXT3
1CD7	7E	0FC5	JMP	NEXT5

in consecutive memory locations starting at 1CDA. Location 1CDA should contain what was in location 0FDA of Uiterwyk's program. The remainder of Uiterwyk's interpreter program is placed in consecutive, ascending memory locations. Of course, the end of Uiterwyk's interpreter can be relocated at any consecutive memory locations below the start of the memory for a user BASIC program. Memory locations referenced in Tables 3 and 4 (Table 4 is discussed below) would have to be changed if the end of the program was relocated at other memory locations.

Table 4 shows the final changes that are made if the end of the program is relocated as described above.

Table 4. Changes necessitated by Relocation

Memory Location	Change Contents to	Memory Location	Change Contents to
016B	1C	0A06	1E
016C	DD	0A07	02
01C2	1D	0A34	1C
01C3	B7	0A35	F2
01D0	1D	0EA0	1E
01D1	79	0EA1	80
01DF	1D	0F6E	1E
01E0	AE	0F67	80
01E6	1D	0F71	57
01E7	93	0F78	4C
01EE	1D	0F75	1E
01EF	68	0F76	80
0283	10	0F84	1D
0284	04	0F85	37
07ED	1D	1D3C	1D
07EE	78	1D3D	51
0867	1E	1DCD	1D
0868	80	1DCE	EE

These changes enable earlier portions of the program to reference the relocated portion of the program. These changes also enable the relocated parts of the program to reference other relocated parts of the program.

USING BASIC

If the above modifications are made in the Uiterwyk BASIC program, the modified program will run with all of the Uiterwyk BASIC features except SAVE, LOAD, and APPEND. After the BASIC program is loaded from cassette storage, the user enters:

G 100 (followed by a carriage return)

That is, memory location 0100 is the cold start location for BASIC. One can leave the BASIC program and enter the monitor program by entering:

PATCH (followed by a carriage return)

BASIC can be reentered from the monitor by entering:

G 100 (followed by a carriage return)

or G 103 (followed by a carriage return)

The G 100 command (cold start) will cause any previous user BASIC program (entered before the user entered the monitor program) to be erased. The G 103 command will cause a return to BASIC without erasing a previous user BASIC program. Thus, memory location 103 is the location for a warm start.

SAVING AND LOADING PROGRAMS

One can save and load programs with the cassette system in the ET-3400/ETA-3400 system. When he has completed a program in BASIC, he can exit BASIC and enter the Heath/Wintek monitor by entering:

PATCH (followed by a carriage return)

Then the user examines memory locations 00AE and 00AF. These locations contain the location of the end of the user BASIC program. Suppose that 00AE contains 23, and 00AF contains 21. The end of the user program is at memory location 2321. The user can save his program on cassette by entering:

CTRL/T T8:location 1, location 2
(followed by a carriage return)

Location 1 is the starting address of the user BASIC program (4000 in my system). Location 2 is the memory location for the end of the user BASIC program (2321 in the above example). The user would enter:

CTRL/T T8:4000,2321
(followed by a carriage return)

for the above example. The cassette system would record a user program starting at 1F00, and ending at 2321. The user must also save the temporary storage information in memory locations 0000 through 00FF. This information is saved at another location on the cassette by entering:

CTRL/T T8:0000,00FF
(followed by a carriage return)

Suppose that one wants to enter the BASIC interpreter in the microcomputer and he wants to enter the program that he previously saved on tape. First, he would enter BASIC in the microcomputer from a cassette that contained the BASIC interpreter. Then the user would enter:

G 100 (followed by a carriage return)

The above procedure would enter and initialize BASIC. The user would then enter the monitor program by entering:

PATCH (followed by a carriage return)

Then he would place the cassette containing his BASIC program and the temporary locations in the recorder and position the tape so that the user BASIC program could be entered. The user would enter:

L8 (followed by a carriage return)

The user would then position the tape so that the temporary locations could be entered. Then he would enter:

L8 (followed by a carriage return)

Finally, the user would enter:

G 103 (followed by a carriage return)

If the user enters:

RUN (followed by a carriage return)

he can run the program that was loaded. Of course, the user can correct or modify the program before it is RUN.

UITERWYK'S BASIC

The book containing Uiterwyk's BASIC has a good description of its features (pages 278 through 300). The small interpreter has more features than one might expect. These features include floating point and exponential calculations to nine digits, arrays with one and two subscripts, etc. One can learn about the BASIC interpreter as he enters it into his ET-3400/ETA-3400 system. Most of the symbols used in the program listing are very helpful in explaining the function of a given section of the program. The text would have been improved if a better printer had been used for the program listing. Many E's look like F's in the program listing. This necessitates checking operational codes for some instructions. Mnemonic code is listed next to the operational code.

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MAC+Edit is not a word processing system and the price reflects that fact. It is, however, a good general purpose editor with features that make it usable for document preparation as well as program development. Through the use of "option" files, tabs and left and right margins can be saved and retrieved. The default tabs are just another "option" file which can be modified to suit the user's needs. An additional utility, SHUFFLE, can be used to copy, move, or insert parts of files into or out of other files. The print function does page numbering, titling, single, double, and triple spacing, and will print up to 99 copies of the document. These features along with the thirty-three (33) function keys make MAC+Edit an outstanding value.

MAC+Edit requires 20K of memory, FLEXTM 9, and a memory mapped video display board. The software is supplied on a 5 1/4" FLEXTM diskette, and includes the MAC+Edit user's manual. Price...\$30.00

MAC Software 404/476-5113
P.O. 1129
Duluth GA 30136

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NEWSRELEASE

DOUBLE DENSITY NOW AVAILABLE FOR THE EXORCISOR BUS

An advanced design floppy disk controller for the Exorcisor bus has been announced by Smoke Signal Broadcasting of Westlake Village, California. The controller, designated the DCB-4A, is an adaptation of the company's DCB-4X board which is the de facto standard controller for the SS-50 bus.

According to Project Manager, Ken Erickson, the decision to produce a version of the board for the Exorcisor bus was made essentially by the users of Exorcisor bus products. Many of them were purchasing the DCB-4A and attaching it to the Exorcisor bus through a wire-wrap card. Thus, there was a built-in market to existing customers once the project was completed. Also, the customers were assured of reliability since the basic design on the SS-50 bus had been proven in thousands of installations.

A unique feature of the board is its ability to handle up to four 8-inch and four 5-1/4-inch floppy drives on the same controller. Single and double density operation is software selectable. Also, the user can specify the track stepping rate under software control. Single or double-sided drives and single or double-track density are also accommodated by the controller. A 1K on-board memory buffer allows data transfer from the disk to take place independent of main processor control; thus, allowing the main processor to handle interrupts and other program tasks while the DCB-4E transfers data to and from the disk.

A multi-user multi-tasking operating system and supporting software is available for the DCB-4E from Microware Systems Corporation of Des Moines.

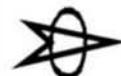
The price of the DCB-4E is \$695 in unit quantities. Contact Jim Allday for more information. (213) 889-9340.

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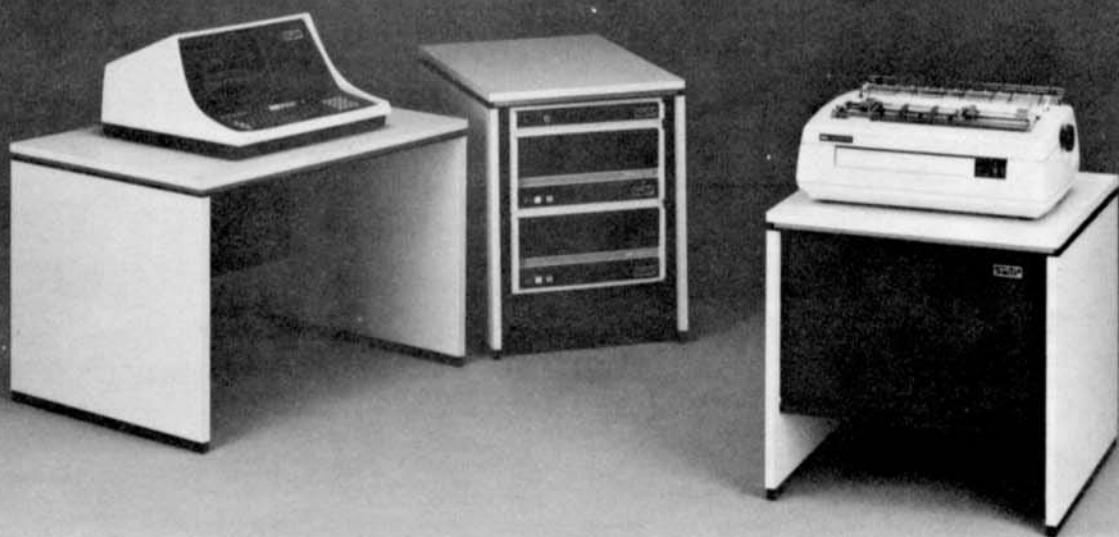
Note: For those who presently have the above packages, an upgrade is available for \$100.

COMING SOON.....

Customer Purchase Mailing List System. This package keeps track of customers and their purchases for mass mailing. This package will be available August 1, 1982 and can be purchased for \$299. (Requires 500K disk storage, Level I or II OS9TM operating system, 132 column printer, and direct cursor address terminal)

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S+ THE CONCEPT

The S+ system is a modular computer system in which all portions of the hardware and software are designed to work together in the most efficient way possible. An S+ single user system with floppy disk storage is a competitive and cost effective entry level system. Unlike most other small computers being sold as "personal", or "small business" machines, the S+ system may be expanded to maximum capabilities using this same hardware and software. You cannot end up with a DEAD END system that cannot be expanded and whose software is not compatible with larger machines. A basic S+ system may be expanded to thirty-two users, a megabyte of main memory and hundreds of megabytes of hard disk storage by simply plugging in, or connecting the desired upgrade equipment.

TOTAL DESIGN—Hardware and Software

The S+ system is an integrated hardware and software design. The two complement and enhance each other in this system. The UniFLEX® operating

system used in the S+ systems is patterned after the Bell Laboratories UNIX® operating system, one of the most admired and widely used operating systems in the world. Instead of being an afterthought, the software is part of the design of the S+ system. You can be sure that with this approach that all parts of the computer operate with maximum efficiency and cost effectiveness.

THE CENTRAL PROCESSOR

The basic S+ system is configured with 256K bytes of memory and can be expanded to more than 1 million bytes. An efficient and fast hardware memory management system is used to allocate the available memory among the users on a dynamic basis. As little as 8K bytes, or the entire memory—if needed—can be used by any individual user. This makes it possible to run very large programs on the system, but it also uses no more memory than necessary for a particular job. The increase in cost effectiveness of this system over crude and outdated bank switching arrangements is dramatic.

The central processor runs in both user and supervisor states. It can detect and reject a defective user program. It is impossible for a user program to go bad and stop the entire system, as can happen quite easily in less sophisticated systems.

Task switching is accomplished by use of a multiple map RAM memory, with sixty-four individual task maps. Each task can access from 4 to 64 K-bytes of memory. Multiple tasks may be used in programs that require more than 64K bytes of memory for execution. When a task is completed the memory is automatically released for other use.

SOFTWARE

The S+ operating system, UniFLEX® is a multiuser, multitasking operating system based on the UNIX® operating system that has been used for many years on Digital Equipment Corp. PDP-11 series minicomputers. It is considered one of the most sophisticated and "user friendly" operating systems available. Variations of UNIX® are rapidly becoming standard on mini and larger microcomputers.

A large variety of languages are available for use with the system. These include FORTRAN, COBOL, BASIC, and Pascal. Word processing packages are also available to give you full text processing capability on the system.

Applications programs are available in large quantities in many fields. This includes general business, medical, dental, veterinary, library and real estate management; plus others. Since the system is multiuser it can also be connected to cash registers to produce a point-of-sale terminal system combined with the computer. The possibilities for application of this system are endless.

THE I/O SYSTEM

The S+ system is totally interrupt driven. All terminal and printer I/O devices connect to an I/O bus separate from the main bus. Up to thirty-two separate devices may be connected to the I/O bus at any one time. If I/O activity is great enough to cause an unacceptable slowdown in system operation, a separate I/O processor can be installed in the system. This plug-in option removes all I/O handling

overhead from the main processor and allows operation of up to thirty-two external devices at 9,600 baud. Without an integrated total design, as in the S+ system, it would become impractical to use a UNIX® type operating system in a situation with heavy terminal I/O activity.

DISK STORAGE

A wide range of disk storage capacity is available for the S+ system, from 2.5 M-byte floppy disks to an 80 M-byte Winchester and many sizes between. All disk controllers use direct memory access (DMA) type operations to maximize data transfer and to minimize overhead on the main processor. The Winchester disks also use intelligent controllers along with DMA transfers to preserve the performance that these type devices are capable of giving. Without this distributed intelligence the system performance would be greatly degraded. The UniFLEX® operating system is designed to work at maximum efficiency with this type disk system. The data transfer rates achieved by this combination rival those of large minicomputers.

COMMUNICATIONS

A high speed local network communications system is available to interconnect S+ systems. The VIA-BUS® network will allow communication between systems at data rates of over 400K baud. Such a system makes it possible to share data between local systems in an efficient and low-cost manner.

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From the system or applications programmer's viewpoint, STAR-DOS looks just like a standard 6809 DOS. There are provisions for multiple 320-byte File Control Blocks, routines to open and close named files, read or write one byte or character at a time, rename or delete files, read or write single sectors, search or modify the directory, and more. STAR-DOS is so powerful that many machine language programs written for the popular big-system 6809 DOS can be run on the Color Computer with STAR-DOS just by changing a few addresses.

STAR-DOS is supplied on disk with a comprehensive user and programmer's manual, which explains all available routines and entry points, along with examples showing how to use them. It also comes with a number of utilities to make use of your disk system even easier and faster. It costs \$49.90 and is available now. Other 6809 software running under STAR-DOS (such as the All-in-One Editor/Processor and Mailbox List Program) will be released soon.

Introl corp.

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AMBA 416/276-2937

July 1, 1982

Mr. Don Williams
68 Micro Journal
P. O. Box 849
Hixson, TN 37343

Dear Don:

The Eratosthenes' sieve benchmark test results that Norm **Compo** included in his July, 1982 "C User Notes" certainly helps point out the speed and efficiency of the 6809 code produced by the Introl-C compiler system. Naturally, we would like to think that Introl-C will emerge as the pace-setter in this regard when it comes to efficient, high-level languages for the 6809. However, only time will tell since several other C compilers and languages for the 6809 have yet to be heard from.

If any of your readers have run the Eratosthenes' benchmark on the 6809 using compilers other than those covered in Norm's study, we would be very interested in hearing what those results are. We have already heard from one user of TSC Pascal and Fortran 77 who ran the Pascal and Fortran Eratosthenes' programs from the September, 1981 BYT8 benchmark article using a 2 MHz 6809. On this basis, Introl-C's execution time of 11.0 seconds compares quite favorable in relation to both TSC Pascal (27 sec) and Fortran 77 (50 sec).

Also, since we will be releasing Introl-C for the UNIPLEX and OS-9 in late July, we will be especially interested in learning just how we stack up against the other C compilers currently being offered for these operating systems.

Any information your readers would be willing to share with us would be greatly appreciated.

Sincerely,

John Wisialowski
John Wisialowski

CORRECTION

Regarding an article in the August issue, by Joseph Wicklund, concerning faults with his 6809 CPU IC, the following information applies.

Shortly after the August issue was mailed I received a call from Motorola (guess they do read 68 Micro Journal after all) inquiring as to the problem Joseph was having with his 6809. They then contacted Joe and he in turn called me back (as did Motorola) and Joe gave me the following information.

Seems that there is a possibility that some 6809 chips, code dated - 7F7924 - had a defective mask. If you have a 6809 with this code, especially the 7F part, I would recommend that you check with Motorola, especially if you have been experiencing the type problem outlined in the August article.

I have not been able to confirm this with Motorola but no harm in checking. It is just possible that Joe's particular 6809 was defective. He reported to me that having replaced it with a newer version (code date) his problem went away.

Hope we did not send too many of you off on a 'bug' search that was not there. If I receive additional info from either Joe or Motorola will let you know.

On the whole, my personal opinion is that the 6809 is the finest 8 bit CPU ever made, even finer than a lot of 16 biters I know of.

DMW ---



TELECOM INDUSTRIES CORPORATION
27 Bonaventure Drive • San Jose, CA 95134 • (408) 262-3100

July 20, 1982

68 Micro Journal
5800 Cassandra Smith
P.O. Box B48
Hixson, TN 37343

Dear Don Williams Sir,

I have been an avid reader and subscriber of the 68 Micro Journal for years now and it is one of the most valuable tools available for the 6809 computer user.

To facilitate the exchange of information among 6809 users, an exchange forum or users group (such as Heathkit HUG) is definitely needed. The 68 Micro Journal could be an ideal center for this type of exchange. The written software for the 6809 user group could be produced by group members and offered for use by other group members at a very small charge. We all know that the 6809 offers an excellent "bang for the buck" and a user's group will help reinforce it.

As a side note - I purchased a MP-32 memory board at a very reasonable price from South East Meads. The MP-32 was shipped promptly as I had been waiting on the phone. I also purchased a port from Thomas Instrumentation and they shipped immediately on a pre-ordained order. The service and telephone assistance that these two companies offered, was very impressive.

Yours very truly,

Vincent

Vincent M. Finelli
Executive Vice President
Satellite Earth Station Division

VHF/TSP
TCOR0037

68 Micro Journal
5900 Cassander Smith Rd.
Nashua, NH 37343

Dear Mr. Williams,

My "GETMUM" letter appeared in the June issue of 68 Micro Journal. However one page of the program listing apparently got lost. Here is the entire listing again if you would like to print it. Thanks.

Sincerely,

Randy Kran
Rt. 2
Keokuk, Iowa 52247

6809 RESIDENT PROGRAM V1.0 07/04/82 03:00:32 PM
PAGE 002 GETMUM

```

0057 0022 EB E0      ADD  +5:      ADD IN NEW DIGIT
0058 0024 89 00      ADDA  80
0059 0026 E7 43      B1P  PROD1+U
0060 0028 34 02      P0MS  A
0061 002A A6 42      L0A  PROD,U
0062 002C E6 C4      L0B  AMPLI1,U
0063 002E 30      MUL
0064 002F EB E0      ADDB  +5:      CARRY FROM LAST OPERATION
0065 0031 89 00      ADDA  80
0066 0033 E7 42      B1P  PROD,U
0067 0035 41      INC  COUNT,U
0068 0037 40      F1TA  NUMBER OF DIGITS
0069 0038 27 DB      HED  GETD1P
0070 003A 80 E0 2A  BADUM  JSR  N1TCH
0071 003D 24 FB      BCC  BADUM
0072 003E 20 02      BEQ  RETM
0073 0041 IC FE      DE1M99  ANDCC 0FFE
0074 0043 32 61      DE1M99  LEAN  1,S
0075 0045 35 D4      PULS  0,3,U,PC
0076 0047
0077 0047
0078 0047
0079 0047
0080 0047
0081 0047
0082 0047
0083 0047 80 30  CMVT  B0A  8830  CONVERT TO BINARY
0084 0049 81 09  CMPTA  B9
0085 0049 23 02  BLS  CMV12
0086 004D 80 07  SUBA  #7
0087 004F A1 C4  CMV12  CMPTA,U
0088 0051 25 03  BLD  MULR
0089 0053 1A 01  ORCC  #1
0090 0055 39  MULR
0091 0056 1C FE  ANDCC  0FFE
0092 0058 39  END
0093

TOTAL ERRORS 0

```

Extending the Life and Range of Old SS-50 Memory Boards

by E. M. (Bud) Pass, Ph.D., President
Computer Systems Consultants, Inc.
1454 Latte Lane, Conyers GA 30207
Telephone Number 404-483-1717/4570

Old SS-50 memory boards may usually be quite easily modified for use with 6809 extended addressing. The change may involve as little as adding one 74S138 chip and one 1000 ohm resistor, cutting one lead, and adding several jumpers. The concept of the change involves interrupting the VMA line as it enters the memory board, allowing VMA to be asserted to the remainder of the logic on the board only if the desired extended address range is present on the bus. This technique delays VMA by only a few nanoseconds and should work unless the board timing is extremely critical.

In order to use extended addressing, the system must be set up properly. If the SWTPC MP-09 CPU board is being used, the Baud-rate generator chip (MC14411) must be removed and a second 74S189 must be installed. The CPU board should also be brought up to the latest of the several modification levels. Specifically, four 470 ohm pullup resistors must be installed (if not already present) on the four output lines of the new 74S189 to regulate +5 volts, for additional noise suppression. Baud-rates must be present on the SS-30 bus (or at least on the serial boards which use them). If necessary, the mother board must be modified by separating the five Baud-Rate lines on the SS-30 from those on the SS-50 bus, as the Baud-rate and extended address signals will mutually interfere.

Most operating systems for the 6809 on the SS-50 bus allow some amount of flexibility in the allocation of extended addresses to the memory boards. Essentially all systems require one or more boards configured for extended address zero for initial system boot operations. Most do not require that the other boards be physically decoded as sequentially higher addresses and will use the address translation hardware on the CPU board to logically relocate the higher-numbered boards to lower extended addresses, just as they use the translation hardware to relocate 4K blocks of addresses within the 64K non-extended address space.

Many CPU and mother boards have no extended address decoding and thus respond to sixteen-bit addresses with no regard to the extended address, mirroring CPU board and I/O functions across all extended address blocks. The primary impact this has on the user is to cause the loss of the use of the last 8K section of every 64K block of physical addresses.

This modification (as shown in the schematics below) has been successfully installed on at least one board, an old MP-16 SWTPC 32K dynamic memory board previously modified for 56K operation. The new chip may either be PiggyBacked on an existing 16-pin chip (by straightening all legs except 8 and 16) or may be installed on the back of the board behind an existing 16-pin chip or socket (by bending legs 8 and 16 backward). The extended address for the board is established by jumpering the board side of the cut VMA line to the appropriate pin on the 74S138. Extended addressing may be temporarily disabled by connecting the 74S138 end of this jumper to pin 5 on the 74S138, which is connected to the bus side of the VMA line.

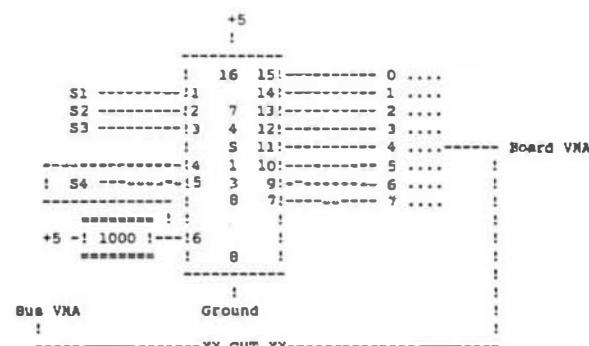
If extended addresses of 0 thru 7 are desired, the first schematic should be used. If extended addresses of 8 thru F are desired, the second schematic should be used. The extra inverter required by the first circuit may usually be found as a spare gate on the board, or may be added as a 74S04.

As shown in the third diagram below, if no DMA is present and VMA is not required by the computer configuration, the bus VMA line may be disconnected from pin 5, the bus S4 line may be moved from pin 4 to pin 5, and pin 4 may be tied to pin 6. The resulting board will decode only extended addresses 0 thru 7, but will not require the extra 74S04 inverter.

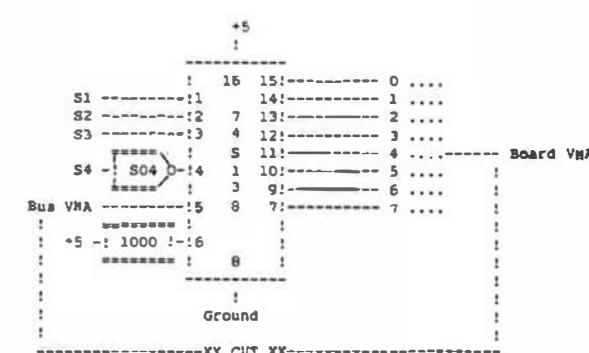
Depending upon software requirements, as little as 4K bytes (in 4K increments) or as much as 56K bytes (or more) may be required for meaningful use of the extended addressing capabilities of the machine.

The changes described here may also be used on other non-memory SS-50 boards, such as Terminus Design Arcade-50, Thomas SS-50 multiple-I/O and Video, Gimix SS-50 ACIA/PIA, Data Systems SS-50 I/O and Disk Controller and Video and other manufacturer's originally non-extended address decoded boards, to allow them to be used on SS-50C busses requiring extended address decoding.

With minor adjustments, the circuits described here could also be used to correct the decoding on the CPU and mother board to recover all except one of the lost 8K blocks of physical addresses described above. In order to be compatible with most existing software, such as Flex, the CPU and I/O board functions should be decoded to extended address F. However, most software will not necessarily automatically use the additional space. VDISK, the simplest means of using extended addresses under FLEX, has an assemble-time option for using the full 64K address space in all 64K blocks (except for F0000). It treats the extended memory as a very fast disk drive.



Extended Addresses 0 Thru 7 Only - No DMA



Extended Addresses 0 Thru 7 Only


```

LDA #12
DO 1111
Do clause 1
**** DO 2222
    TST 0,I
    WHILE 2222.PL
    Do clause 2
*****
    DOEND 2222
Do clause 3
*****
COUNT 1111,A
LOOP 1111
DOEND 1111

Clauses 1 and 3 are executed 12 times. Assuming
that the count in register A is not destroyed.
WHILE 2222 will also be executed at least 12 times
and each time Clause 2 will be executed repeatedly
as long as the byte at 0,I is positive.

FLIPB MACRO
• USED INTERNALLY BY JFS AND WHILE MACROS
• PARSE/SET A 10 LABEL
• 2 10 BRANCH OP CODE TO FLIP
• 3 10 L IF LONG BRANCH REQUIRE
• GENERATE BRANCH ON OPPOSITE CONDITION
FLIPB SET *
    IFC #2,BEQ
    #3BNE #1
    ENDIF
    IFC #2,BNE
    #3BED #1
    ENDIF
    IFC #2,BMI
    #3BPL #1
    ENDIF
    IFC #2,BPL
    #3BPI #1
    ENDIF
    IFC #2,BCC
    #3BCC #1
    ENDIF
    IFC #2,BCC
    #3BCC #1
    ENDIF
    IFC #2,BGT
    #3BGE #1
    ENDIF
    IFC #2,BLT
    #3BLT #1
    ENDIF
    IFC #2,BLT
    #3BLT #1
    ENDIF
    IFC #2,BVC
    #3BVB #1
    ENDIF
    IFC #2,BGE
    #3BGE #1
    ENDIF
    IFC #2,BLE
    #3BLE #1
    ENDIF
    IFC #2,BGE
    #3BGT #1
    ENDIF
    IFC #2,BLT
    #3BLT #1
    ENDIF
    IFC #2,BMI
    #3BPL #1
    ENDIF
    IFC #2,BPL
    #3BPI #1
    ENDIF
    IFC #2,BLS
    #3BHS #1
    ENDIF
    IFC #2,BLS
    #3BHS #1
    ENDIF
    IFC #2,BLO
    #3BHS #1
    ENDIF
    IFC #2,BHS
    #3BLO #1
    ENDIF
    IF FLIPAA==*
    ERA ---> UNSUPPORTED BRANCH OPCODE
    ENDIF
    ENDM

FLIPB MACRO E11,342,83
ENDM

IFNE MACRO
#3B42 #1
ENDM

ELB0 MACRO
IFNC #2,NEXT
#3BAA F81
ENDIF
&1 EQU *
ENDM

IFEND MACRO
F&1 EQU *
ENDM

IFEXIT MACRO
#2BAA F81
ENDM

DO MACRO
D&1 EQU *
ENDM

DOEND MACRO
Z&1 EQU *
ENDM

DOEXIT MACRO
#2BAA Z81
ENDM

LOOP MACRO
#2BAA D81
ENDM

WHILE MACRO
FLIPB Z81,342,83
ENDM

UNTIL MACRO
#3B82 Z81
ENDM

COUNT MACRO

```

• TRANSLATE SUBROUTINE

```

INPUT X => SOURCE TO BE TRANSLATED
Y => TRANSLATION TABLE
A = LENGTH OF SOURCE IN VTES
B = MASK FOR SOURCE I.E. $3F TURNS OFF TOP 2 BITS
BEFORE TRANSLATION GIVING RANGE OF 0-63

• OUTPUT X,Y,U,A,B,CC UNCHANGED
• SOURCE DATA IS TRANSLATED INTO CORRESPONDING BYTES IN TABLE
• IF EACH BYTE I IS REPLACED BY THE BYTE AT (168),Y

STRAND EQU *
PSEG A,B,CC,X
DO TRANT
    LDB 2,5 SET MASK
    ANDS 0,I AND IN NEXT SOURCE BYTE
    LDB 2,Y SET TRANSLATION
    STB 0,I+ AND STORE BACK IN SOURCE
    CLOOP TRANT,A
DOEND TRANT
PULS A,B,CC,X
RTS

```

• TRANSLATE AND TEST SUBROUTINE

```

INPUT X => SOURCE
Y => TRANSLATION TABLE
A = SOURCE DATA LENGTH IN VTES
B = MASK FOR SOURCE I.E. $3F TURNS OFF TOP 2 BITS
BEFORE TRANSLATION GIVING RANGE OF 0-63

• OUTPUTS - WHEN A SOURCE BYTE IS TRANSLATED I TO A NON-ZERO
VALUE THE ROUTINE RETURNS WITH THE FOLLOWING SETTINGS
X => BYTE FOLLOWING THE BYTE JUST TRANSLATED
A = REMAINING COUNT+1
B = TRANSLATED BYTE
V = THE ORIGINAL VALUE IN X
CARRY IS NOT SET
U AND THE SOURCE ARE NOT CHANGED

• OTHERWISE - IF ALL TRANSLATED BYTES RESULTED IN ZERO
X => BYTE FOLLOWING THE BYTE JUST TRANSLATED
A = 0
B = LAST TRANSLATED BYTE ( = 0 )
V = THE ORIGINAL VALUE IN X
CARRY IS SET
U AND THE SOURCE ARE NOT CHANGED

STRANT EQU *
PSEG B,I SAVE MASK AND START LOCATION
DO TRANT
    LDB 2,5 SET MASK
    ANDS 0,I AND IN SOURCE BYTE
    LDB 2,Y SET TRANSLATION
    IFS TRANSLATED
    • TRANSLATION IS ZERO
        CLOOP TRANT,A CONTINUE SCAN IF MORE DATA
        DADD #901 SET CARRY ON IF END REACHED
        ELSE TRANT
    • NON ZERO TRANSLATION
        DADD #90F TURN CARRY OFF
        IFEND TRANT
        DOEND TRANT
        STB 0,B SET TRANSLATED BYTE FOR RETURN
        PULS B,Y
        RTS
    • THIS PROGRAM DEMONSTRATES STRUCTURED ASSEMBLER
    • TECHNIQUES USING STRMACS , AND ALSO THE USE OF
    • THE TRANSLATE SUBROUTINES .
    •
    • LIB STRUMACS
    •
    • FLEX EQUATES
    •
    LINESBUF EQU $C000 LINE BUFFER
    WRAMS EQU $C003
    PCLRF EQU $CD24
    PUTCHR EQU $CD18
    TTYEOL EQU $CC02 EDL CHARACTER
    TCCR EQU $0D
    •
    DRG $C100
    •
    START EQU *
    LDS $C6500 SET STACK
    •
    • SET UP EDL CHAR IN DELIMITER TABLE
    •
    LDA TTYEOL
    LEAX DELIM,PCR
    STA A,Z SET EDL CHAR IN TABLE
    •
    • USE STRANT TO LOCATE THE END OF THE LINE IN THE LINE BUFFER
    LDX $C100BUF
    LDA $128 MAX LENGTH
    DO STRANT
        LDB #978 SET MASK
        LBY DELIM,PCR
        LBSR STRANT
        WHILE BLENI,CC
    • DELIMITER FOUND
        DO DRUG
            CDBS STRCA CR FOUND
            WHILE BLENI,ED
            LEA -1,X STEP BACK TO LOSE CR
            DOEXIT BLENI
            REND BLENI
        LOOP BLENI
        DOEND BLENI
    • PRINT THE BUFFER
    LDY $100BUF
    BSR OUTYTX
    • NOW DEMONSTRATE STRAND BY TRANSLATING LOW( $\rightarrow$ )UP CASE AND PRINTING
    • (UPPER A FEW TIMES)

```

UNIVERSAL DATA RESEARCH INC. ANNOUNCES "DISKBUB" BUBBLE
MEMORY THAT LOOKS LIKE A DISK

For further information contact
Joel Heckman
Universal Data Research Inc.
2457 Wherle Drive
Buffalo, New York 14221
716-631-3811

Universal Data Research Inc. announces "DISKBUB", a compact bubble board with 128k bytes of data storage, which will interface to the PLEX operating system using 68xx processing family, with a 30 pin as 56 I/O bus. DISKBUB acts like a disk but has the advantages of bubble memory, high reliability data storage and operation in harsh environments where no disk would dare to go. Its applications in process control, automation, data logging, and robotics are endless.

The rugged solid state bubble memory is non volatile, with no moving parts to wear, and no oxide to rub off. Also, because it is hermetically sealed, DISKBUB is unaffected by outside contaminants, high humidity, high shock, and vibration. The DISKBUB can be used to boot up systems replacing the need for disks all together.

DISKBUS is available from Universal Data Research Inc for \$995.

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1982 June 12

Don Williams, Sr., Publisher
Micro Journal
5900 Cassandra Smith Rd.
P. O. Box 849
Hixson
Tennessee 37343

Dear Mr. Williams:

I have recently had the opportunity to use the Omegasoft Pascal compiler (version 2.0), and thought I'd pass along my evaluation of it.

The language Omegasoft chose to implement is excellent - it includes all of standard Pascal (with some minor exceptions which are unimportant to me and probably to most other people). It also includes significant extensions, such as the ability to access specific memory locations. I was developing a 3D line program, and wanted to stick as close as possible to standard Pascal. The program involves geometric and topological calculations and some fairly complicated data structures (arrays of structures which include variant records and structured fields). I believe there are only 5 lines which deviate from the standard. (They involve opening and closing files.)

The documentation is also excellent - clear, complete, and above all accurate.

Program development is fast, because the compiler is fairly fast, and a debugger is included. On a 2 MHz 8/09, compiling, loading, and running my complete program can take less than 10 minutes, including the time to edit the program slightly before compiling. Thus, I can fix several minor bugs per hour. (Compiling without output, to check program syntax, takes about .5 seconds, 10 of which is loading the compiler.)

Furthermore, most of the debugger is written in Pascal, and the source is included. I have made several slight changes in the debugger, and they were easy.

But probably the most important information for me to mention is that there are very few errors in the compiler, and support is excellent. In the course of developing this program, I have found only one situation in which the compiler generated bad code. (It involved nested records.) I called Omegasoft, and was told that bug had already been reported and a fix was in the mail. I got it the next day. After finishing the program, I sent a letter reporting some minor bugs. Nine days later I received an excellent letter responding to each of the points I had raised (and promising to fix each of the bugs in the next version of the compiler).

I am very impressed, and would like to tell Omegasoft publically
"Keep up the good work!"

Yours truly,

Richard F. Smiley
Software Engineering Consultant

27 June 1982

J. William Stull
37 Sta. Monica Dr.
Pasig, Metro Manila
Philippines

69 Micro Journal
3018 Hamill Rd.
P.O. Box 849
Hixson, TN 37343
U.S.A.

Dear Mr. Williams,

I have been a reader of 68MJ since 1979 when I built a SHITPC 6800 system using cassette storage, a PR-40 printer, and a CT-64 terminal. I later upgraded to FLEX12 and then to a 4809 cpu using FLEX9, upgrading my CT-64 to a CT-82 and my printer to a Centronics 737. My latest upgrade is to a HELIX mainframe and a G1MIX double density PIO disk controller using RUMBUCH by Peter Stark as the system monitor. I made a few changes to make it all work which I would like to share with your readers who might be considering doing the same. This system has been running very smoothly over some years in this financial environment.

First of all: HUMBUG version 1.1, Model H074KSWT16E is the monitor and will not work as is on the 2 Mhz HELIX system. I therefore made the following mods:
 Change F514 from \$04 to \$09 (increase boot delay for 2 Mhz cpu)
 Change FF19 to \$4C,\$A7,\$2E,\$A7,\$0E,\$20,\$04 (DAT handling)
 The clear screen command string at F3AD might not be correct for your terminal. For the CT-82, change the string to \$10,\$16,\$10,\$16 (repeated ROMSEL,ERASE). There is a fair amount of unused space in the HUMBUG EPROM so I added a new command to configure my terminal. It is a prompting by number type and seems to work well. It is too long to include here but I am sending it to Peter Stark.

When I went to write the data back to the EPROM, I found that the WRITPROM.CMD would not work on the 2Mhz system. I made the following changes to the program:
 Change 101E from \$2A to \$2B
 Change 1380 from \$7C to \$F9
 Change 1689 from \$32 to \$31

The WRITPROM.CMD now works very well at 2Mhz using a SWTPC MP-R programmer board. I did not have to change any parts on the MP-R board either.

The HELIX system has been reviewed in 68M7 and in general, my comments are the same. I like to use the terminal clock to control the baud rate by software, so I added a jumper from pin 24 of the HELIX port 1 RS-232 connector to pin 15 of the header, H2 at the rear of the motherboard and cut the H2 jumper that was between pins 5 and 15. I now have a system that is very dependable and enjoyable. I have likewise enjoyed your magazine for the past 3 years. Keep up the good work!

Yours truly,

Brian Stark

Bill Stark

GIMIX INC 1227 WEST 37TH PLACE • CHICAGO, ILLINOIS 60609 • (312) 977-5510 • FAX (312) 221-0066

Press Release

INTELLIGENT SERIAL I/O PROCESSOR BOARD NOW AVAILABLE

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Mr. Don Williams
 '68 Micro Journal
 P.O. Box 849
 Hixson, Tenn. 37343

June 26 '82

Dear Don:

I was very pleased with your note for a better EPROM programmer which is available from SWTPC. (I can not recall the exact page or issue of 68 micro.). I took another approach to have a programmer which can work at 2 Mhz system clock, patching WRITPROM.CMD. I not only faced the inconvenience of 1 Mhz clock use in WRITPROM.CMD but also the possible damaging of the some 2716's from different sources. The 2716's from Intel and 2516 from Texas Instruments are programmed fine with WRITPROM.CMD but the 2716's from National Semiconductors and AMD are damaged. 50 m.sec. PG/PG4 program pulse seems to be too long for these 2716's. To solve these problems I tried a few patches at WRITPROM.CMD.

Using DYNAMITE.CMD disassembler I could locate the basic time loop routine (1 m.sec. at 1 Mhz clock) at \$137E,

```

137E 0E 007C L137E LDX #$007C 1 m.sec. loop
1381 30 1F L1381 LEAX -1,X
1383 26 FC BNE L1381
1385 5A DECB IX(ACCB) m.sec.loop
1386 26 F6 BNE L137E
1388 39 RTS
  
```

50 m.sec. program timing is located at \$1282.

```

1282 C6 32 LDB #$32 50 m.sec.
1284 BD 137E JSR L137E gosub timing loop
  
```

Also I noticed the program checks CPUTYP clock frequency at \$1018.

```

1018 7D CC33 TST CPUTYP
101E 2A 08 BPL L1028 if 1 MHz goto next
step
1020 8E 1664 LDX #$1664 get 2 Mhz notice
message
  
```

Now it is obvious that \$7C at \$1380 to be changed

to \$FA and \$2A at \$101E to \$28 (BMI instruction) for 2 Mhz clock, and \$32 at \$1283 to be changed to \$25 for 57 m.sec. PG/PG4 program timing interval. Patches for each modification are shown in following table.

	WPROM1TI	WPROM1NS	WPROM2TI	WPROM2NS
Clock	1 Mhz	1 Mhz	2 Mhz	2 Mhz
Supplier	TI, Int	NS, AMD	TI, Int	NS, AMD
\$101E	\$2A	\$2A	\$28	\$28
\$1283	\$32	\$25	\$32	\$25
\$1380	\$7C	\$7C	\$FA	\$FA
\$1689	\$32	\$32	\$31	\$31

TI: Texas Instruments
 NS: National Semiconductors
 Int: Intel
 AMD: Advanced Micro Devices

The READPROM.CMD works at 2 Mhz if 68820 is used at MP-R programmer board. I found a 6820 which works properly at 2 Mhz, so you may try too.

Now I can use cheapest 2716-1 (2 Mhz) for programming. I spent a whole Friday night for above but it is my hobby to do so. So I should not feel guilty not to read any articles or books for my own profession, nor stupid not to have a good time at one of the restaurants near by.

Sincerely yours;

C. Kitzman

Midempsa Kitzman, R.D.
 11720 Edgewater Dr.
 Lakewood, Ohio 44107

SOFTWARE EPROM SELECTION FOR THE SCB-69

Richard H. Rae, CEA
 Unique Technologies
 P.O. Box 671
 Emporia, VA 23847

Smoke Signal Broadcasting's SCB-69 CPU board is an extremely versatile, quality product for the Fifty buss. However, those of us desiring to run both 6809 and 68-9 on this board have had to tolerate swapping chips, because both operating systems require an EPROM residing at \$8000 to \$FFFF. This article describes a relatively simple modification which eliminates the problem.

The SCB-69 provides five sockets for 2K EPROMs. In the standard configuration the highest EPROM resides at \$8000 to \$FFFF, with the other four sockets situated in a block of memory from \$0000 to \$FFFF. In a 56K system, the two lowest sockets are overlayed by RAM and are therefore useless. This modification moves these sockets to the same address as the two highest EPROMs and allows the user to select, via software, which pair will be accessed. Perhaps the most interesting aspect of this conversion is that Smoke Signal was kind enough to provide us with almost all the logic needed for the conversion, requiring us to supply only a quad NAND (octave and its socket).

Begin by examining the SCB-69 CPU board carefully. Locate sockets U21 through U25 and wiring blocks W4 through W8 located directly above them. Cut jumper 4 on all but W6. On W7 and W8 cut jumper 2 also.

You are now going to make a few jumper connections to the wiring blocks. Looking at the front (component side) of the board, notice that the left vertical row of pads for each wiring block is numbered 1 through 4. All connections should be made to the left or numbered side of the wiring blocks. Do not make any connections to the pads on the right side.

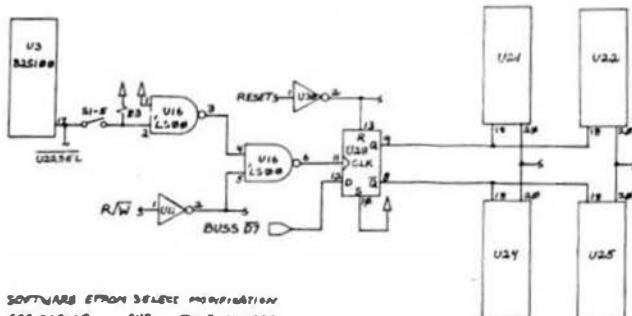
Jumper 4 on W4 to 4 on W5; also jumper 4 on W7 to 4 on W8.

Jumper 2 on M6 to 2 on M7; also jumper 2 on M5 to 2 on M8.

Install a 14 pin socket in the spare location U16. Insert the socket so the lower two pads of the 16 pin PC pattern are unused. Solder a jumper from pin 7 of the 14 pin socket to VBS, which runs immediately below the socket.

Now a list of connections to make:

U16 PIN 1	TO U16 PIN 14
U16 PIN 2	TO S1 PIN 5
U16 PIN 3	TO U16 PIN 4
U16 PIN 5	TO U11 PIN 2
U16 PIN 6	TO U28 PIN 11
U28 PIN 8	TO W7 PIN 4
U28 PIN 9	TO W4 PIN 4
U28 PIN 10	TO U28 PIN 14
U28 PIN 12	TO S50 PIN 43 (07)
U28 PIN 13	TO U30 PIN 2
S1 PIN 6	TO U3 PIN 17
S1 PIN 5	TO 23 PIN 6



On the connections to M6 and M7, remember to connect to the left side of the blocks, looking at the front of the board. Pin 43 on the S50 Datas is the eighth pin from the right side, on the component side of the board. Pin 5 of S1 is next to pin 6 of S3; you should be able to just bend these pins together and solder.

Install a 74LS00 in U16 (a 7400 will work as well.) Four EPROMs go in as follows: The program to be executed on power-up or on reset goes in U21 (I prefer M696 here). If you have a companion chip it goes in U22. Install your secondary EPROMs in U24 (and U25). Remember that, when populated, U24 corresponds to U21 and U25 replaces U22. Any EPROM placed in U23 is active at all times. Here is a typical setup (minim): M6969 in U21, FLEX3 boot in U22, nothing in U23 (yet!), OS-9 P1 in U24, and OS-9 P2 in U25.

Now to set the switches. S1-5 controls the software select option. In the off position, U21 through U25 are always active; U24 and U25 don't assist. In the on position software select is enabled. S2-1 enables U21 or U24 and MUST be on. If you have an EPROM in either U22 or U25, you must also turn on S2-2. S2-3 controls U23 as always. S2-4 and S2-5 now have no function and should be left in the off position. S2-6 through S2-8 operate as before and should be left alone.

Turning power on or hitting reset will always select the U21-U22 pair of sockets. To select the U24-U25 pair, write any number with bit 7 off (00 is easy to remember) to any location between \$B000 and \$B2FF. This is an EPROM exact - either U22 or U25 - and as such is never written to under normal conditions. To select the U21-U22 pair again, write any number with bit 7 on (1 = FF) to the same range of locations. Hitting reset also accomplishes this. Thus my system comes up in M6969. To boot OS990 I hit "0"; "8" boots FLEX3, and running the following program boots OS-9:

```
COL07 EQU $FFAE RESET VECTOR IN MY COPY OF OS-9
ROMCTL EQU $E000 ADDRESS WHICH CONTROLS EPROMS
OS-9 EQU $0000 GET AUXILIARY ERROR SELECT CODE
STA ROMCTL SELECT OS-9 EPROMS
JMP COL07 COLORBOT OS-9
```

Similarly, substituting the D08690 or FLEX boot vector and SPP for the select code gets me back from OS-9 to D08 or FLEX. Variations of these programs work as transient commands; with proper care one can move from D08 to FLEX to OS-9 in any sequence, at will.

I am certain there are ways to do this which are much more flexible, but for about fifty cents in parts, a half hour's time, and flawless performance this simple modification can't be beat.

WARNING: This modification will most certainly void any warranty you may have on your CPU board! This modification was installed on REV 3 of the SCB-69 CPU board; others may be different. If you are using one of the alternate ZPROM memory maps shown in the SCB-69 manual you should be sure that no conflicts will occur before attempting this modification.

FLEX3 is a trademark of Technical Systems Consultants, Inc.

OS-9 is a trademark of Microshare Systems Corporation.

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378 Broadway Ave.
Minneapolis, Minnesota

June 2, 1982

Don Williams
C/O 68 Micro Journal

Dear Don,

Having recently assembled Digital Research Computer's 32K 88-30 static ram kit I recommend it to those considering such a kit. The circuit board is an excellent quality double sided board with plated through holes. It is color coded and silk screened with all

component locations clearly marked. The documentation is adequate for someone with some experience assembling kits. But it is not for the neophyte. Assembly instructions are of the form: install disk capacitors at locations C1 to C10. The board is assumed to be fully populated and must be addressed on a 32K boundary. As none of the memory can be disabled you can only address the board on an odd 32K boundary. If extended addressing has been selected, the board has been performed flawlessly in my 8800 system since I assembled it.

If you live in Canada be prepared for a long wait (the kit is shipped via surface mail), two weeks to process the order plus four weeks for shipping. My kit was shipped with the wrong socket set which caused another two week delay. My request for the correct socket set was handled with reasonable courtesy and promptness.

The kit appears to be a good product worth purchasing. Now that I have read seven issues of your publication and made purchases from your advertisers (some of whom I never saw before), I feel that your magazine is worthwhile. I hope to see more product reviews and technical information.

Best regards,
Randy Cooper

Electronic Component Service, Inc.

212-846-2600

89-00 130TH STREET
RICHMOND HILL, NY 11418

June 29, 1982

Robert May
68 Micro Journal
5900 Ceasarian Smith
Roxton, TN 37343

Dear Bob,
Here is a report on my experience with Westchester Applied Business Systems Software (WABSI): The Data Management System, and Basic Accounting System. WABSI software was designed to run under Flex and any 6809 CPU. His ad caught my eye in 68 Micro Journal so I sent for the user guides. After thoroughly examining them, a demo would be in order. I met with Bill Adams of WABSI and he answered all my questions besides giving me an excellent demo of the software capabilities. I purchased the system on the spot.

The following are of findings after using WABSI's software.

Basic Accounting System

The basic accounting system filled all the needs of my business plus some. The great thing about the WABSI accounting package is everything is included. No need to buy separate packages. It already contains a provision for a products and accounts file and provides the following reports: Journal, ledger, balance, income, and monthly class programs.

To set up the entire accounting system costs approximately 3 hours. It took me that long because I never worked with a computer before. The directions included in the user guide are in simple english with excellent examples. Keep in mind that the accounting system is generic. The user defines to the system the size and format of the accounts and products file. Also I neglected to mention that the Accounting package includes automatic payable and receivable.

Data Management System (DMS)

The DMS consists of the following subparts: The DMS nucleus, Define, update, Generate, format, and VIDEON programs. Taking them one at a time are as follows. The DMS nucleus simply contains over 200 common functions used by WABSI.

The Define program enables the user to specify the format and content of a database file. I have in the past year 3 files to track various item dealing with customer accounts and products.

The update program lets the user edit any of the databases. The user is able to input, review, change, and delete database records. To use the update program the database needs to have been previously defined by the user.

The most versatile program of the DMS is Gener. To sum it up in a word would be magic. Gener uses English like non-procedural language to produce reports, inquiry, and to generate new databases. Gener can be used to sort databases, combine information from different databases and calculate any specified field in any direction. Gener will take output fields from different databases and group them together in any desired format, run calculate logic on them, reformat them and build a new file containing that information. Gener is useful in creating control files for batch processing. The list of Gener commands totals approximately 37.

Next in line is the Format program. I can't say too much about it because I've never used it. Recently I received a bill from WABSI. I found later it was printed by the format program. So I contacted WABSI as on how to do this with my system. I was surprised to find that I already had the same capability.

The final program I will talk about is VIDEON. It is used to format a page disk to expand the computer's capacity to over a megabyte.

My personal opinion of WABSI's software is first class all the way. It has served me well in business and I certainly got my money's worth out of it. I would recommend it to anyone looking for a good solid application software system at a reasonable price. Bill Adams of WABSI has been very helpful to me and I want to take this opportunity to thank him for his patience in helping me make the best software decision that I possibly could.

Sincerely
J. R. Shook
James E. Shook

Don Williams, Sr., Editor
68 Micro Journal
5900 Ceasarian Smith
Computer Publishing Center
PO Box 649
Minotola, TN 37343

RE: ENLARGING THE FLEX DIRECTORY

The following discussion applies specifically to Flex formatted double sided, double density (not extra density) diskettes. However, similar logic can be applied to any Flex diskette. Normally, a Flex diskette starts out with a directory on track 00. This directory starts with sector 05 and continues thru sector 18, yielding 26 sectors, each containing 10 entries, for a total of 260 files. If more than 260 files are needed in the directory, Flex will automatically extend the directory. However, Flex will only extend the directory one sector at a time, yielding only 10 additional directory entries. Ten files later, Flex will once again have to extend the directory. If a System disk contains 361 files, then Flex will have had to extend the directory 31 times. Flex users know that this creates a significant

'88' Micro Journal

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MEMORY LOSS?
ERRATIC OPERATION?

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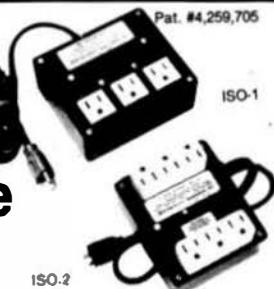
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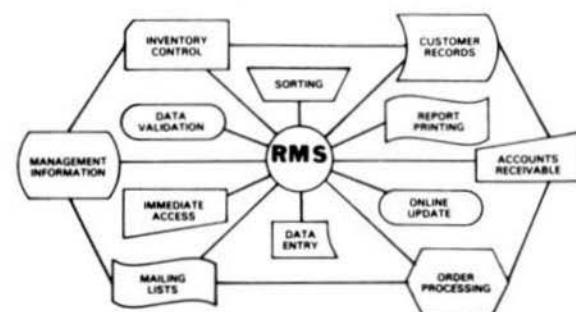
6809

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RMS

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\$39⁵⁰ bare board

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- Solder masked top and bottom
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- Compatible with the 20-bit extended addressing mode
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- An optional NMI debouncing circuitry is on board
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- Utilizes the 6845 CRT Controller
- Software selectable format up to 80 by 24
- Character font in one 2716 Eprom
- 2K Screen Buffer
- Selectable on any odd 2K boundary

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- 2-ACIA's and 2-PIA's
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Business people use spread-sheets to organize columns and rows of figures. DYNACALC simulates the operation of a spread-sheet without the mess of paper and pencil. Of course, corrections and changes are a snap. Changing any entered value causes the whole spread-sheet to be re-calculated based on the new constants. This means that you can play, 'what if?' to your heart's content.

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3. What will DYNACALC do for ME?

That's a good question. Basically the answer is that DYNACALC will let your computer do just about anything you can imagine. Ask your friends who have VisiCalc, or a similar program, just how useful an electronic spread-sheet program can be for all types of household, business, engineering, and scientific applications.

4. Do I have to learn computer programming?

NO! DYNACALC is designed to be used by non-programmers, but even a Ph.D. in Computer Science can understand it. Built-in HELP messages are provided for quick reference to operating instructions.

5. Do I have to modify my system to use DYNACALC?

Nope. DYNACALC uses any standard 6809 configuration, so you don't have to spend money on another CPU board or waste time learning another operating system.

6. Will DYNACALC read my existing data files?

You bet! DYNACALC has a beautifully simple method of reading and writing data files, so you can communicate both ways with other programs on your system, such as the Text Editor, Text Processor, Sort/Merge, RMS data base system, or other programs written in BASIC, C, PASCAL, FORTRAN, and so on.

7. How fast is DYNACALC?

Very. Except for a few seldom-used commands, DYNACALC is memory-resident, so there is little disk I/O to slow things down. The whole data array (worksheet) is in memory, so access to any point is instantaneous. DYNACALC is 100% 6809 machine code for blistering speed.

8. Is there a version of DYNACALC for MY system?

Probably. You need a 6809 computer (32k minimum) with FLEX or UniFLEX operating system. A version for OS-9 is also in the works. You also need a decent CRT terminal, one with at least 80 characters per line, and direct cursor addressing. If your terminal isn't smart enough for DYNACALC, you probably need a new one anyway. The UniFLEX version of DYNACALC also allows you to mix different brands of terminal on the same system. There's also a special version of DYNACALC for Color Computers equipped with FLEX and Data-Comp's F-MATE. A version for Frank Hogg's Color Computer FLEX is also being done.

9. How much does DYNACALC cost?

The FLEX versions are just \$200 per copy; UniFLEX version \$395. Foreign orders add \$10 per copy for postage. We encourage dealers to handle DYNACALC, since it's a product that sells instantly upon demonstration. Call or write on your company letterhead for more information.

10. Where do I order DYNACALC?

See your local DYNACALC dealer, or order directly from CSC at the address below. We accept telephone orders from 10 a.m. to 6 p.m. Monday through Friday. Call us at 314-578-5020. Your VISA or MasterCard is welcome. Please specify diskette size for FLEX versions. Software serial number is required for the UniFLEX version of DYNACALC.

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UniFLEX software prices include maintenance for the first year.

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NOTE: All are as published or received by 68 Micro Journal, some have fixes and patches.

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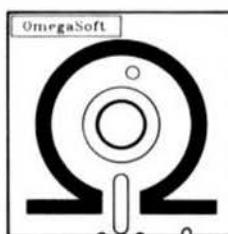
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TM: MDOS, XDOS, Motorola trademarks; Flex, TSC trademark; DOS69, Smoke Signal Broadcasting trademark; OS-9 Microware trademark.



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FLEX* and UNIFLEX* Software

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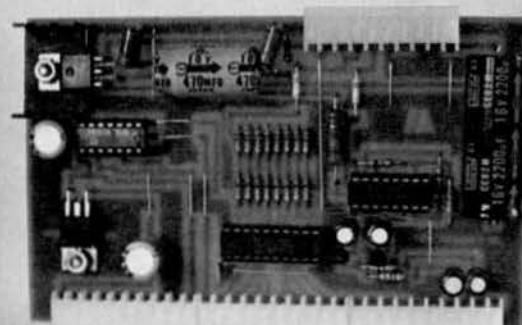
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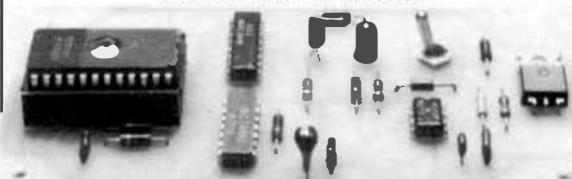
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אנו מודים

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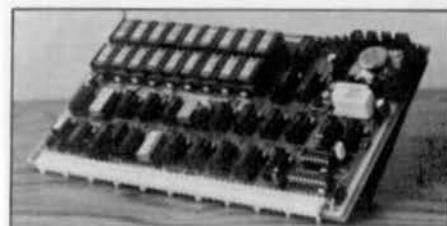
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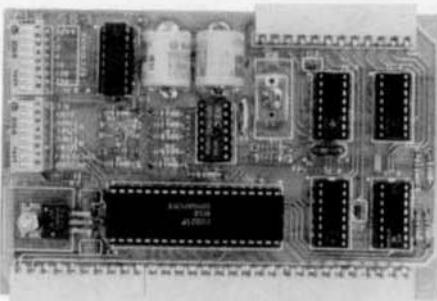
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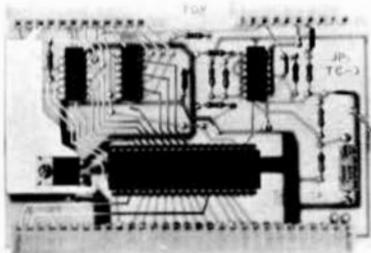
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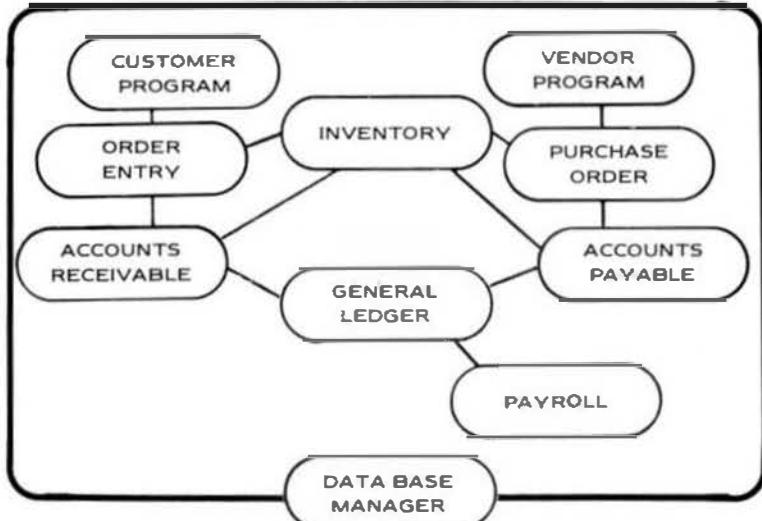
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64K SS-50 STATIC RAM

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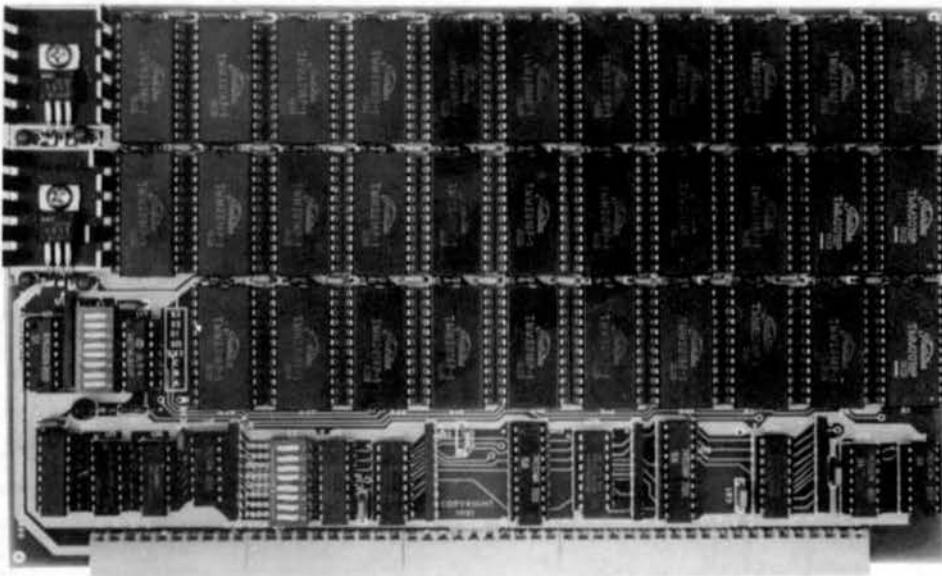
\$259⁰⁰

(48K KIT)

NEW!

LOW POWER!

RAM
OR
EPROM!



BLANK PC BOARD
WITH DOCUMENTATION
\$52

SUPPORT ICs + CAPS - \$18.00
FULL SOCKET SET - \$15.00

ASSEMBLED AND TESTED ADD \$40

FEATURES:

- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports Extended Addressing.
- ★ 64K draws only approximately 500 mA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- ★ 2716 EPROMs may be installed anywhere on Board.
- ★ Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- ★ One Board supports both RAM and EPROM.
- ★ RAM supports 2MHZ operation at no extra charge!
- ★ Board may be partially populated in 16K increments.

56K KIT	\$309
64K KIT	\$359

16K STATIC RAMS?

The new 2K x 8, 24 PIN, static RAMs are the next generation of high density, high speed, low power, RAMs. Pioneered by such companies as HITACHI and TOSHIBA, and soon to be second sourced by most major U.S. manufacturers, these ultra low power parts, feature 2716 compatible pin out. Thus fully interchangeable ROM/RAM boards are at last a reality, and you get BLINDING speed and LOW power thrown in for virtually nothing.

Digital Research Computers

(OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Add \$2.00 postage. We pay balance. Order under \$15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over \$50, add 85¢ for insurance.

ARCADE 50

POWERFUL COLOR GRAPHICS

Uses the new TMS9918A Video Display Processor. High resolution 256 x 192 pixel display with 16 colors. 16k Bytes of onboard RAM does not reduce user memory. 32 graphic images can be individually moved with simple X-Y commands for smooth animation.

External video input allows subtitling.

NTSC composite video output

SOUND EFFECTS AND MUSIC

Three AY3-8910 Programmable Sound Generators

Nine simultaneous voices

Three independent noise sources

Onboard stereo amplifier drives two 8 ohm speakers

ADDITIONAL I/O CAPABILITIES

Eight analog inputs with 8 bit resolution
Supports four joysticks with pushbutton switches
Eight bit parallel I/O port
Entire unit maps into 256 bytes of memory

DOCUMENTATION AND SOFTWARE

Programming manuals for Video and Sound

Processors

Subroutine library and Super Demo Maze Game
Example programs in BASIC, FBASIC and ASSEMBLY

User library and sales support

ARCADE 50, assembled and tested	\$325.00
Video and Audio connector set	15.00
4 Joystick connector set	15.00
2 Radio Shack Joysticks	24.00
UHF channel 33 modulator	32.00
Gold Molex connectors	12.00
A/BASIC for 6809	110.00
FBASIC for 6809	110.00
FBASIC (with ARCADE 50)	75.00
ARCADE 80 (TRS MODEL I)	395.00
LABVIDEO (Motorola EXORbus)	375.00
NEW MV09 6809 Processor Board	225.00

* Comes assembled with PIA and ACIA

* 12 Sockets for 2716, 2732 or RAM

* Supports DMA disk I/O

* Ideal for 6809 upgrade or process control

TERMINUS DESIGN INC

16 SCARBROUGH ROAD

ELLENWOOD, GA 30049

(404) 474-4866

PRODUCTS IN THE MIX

RGB ARCADE 50 ADAPTOR

ARCADE 100 (S-100)

DMA Disk Controller

FBASIC

TERMINUS DESIGN INC, in conjunction with Microware Systems Corporation, is proud to announce FBASIC - an enhancement of Microware's 6809 A/BASIC. Their fast compiled BASIC has been adapted for 6809 users with added video and sound features for ARCADE 50 users. FBASIC is a true compiler that produces optimized machine language modules which are ROMable and require no Run-Time package. FBASIC requires less memory overhead and runs hundreds of times faster than BASIC interpreters. It supports standard BASIC instruction including String functions, Disk I/O and fast integer arithmetic with multiple-precision capability. Graphics verbs and functions fully support the ARCADE 50 Arcade statements include:

INIT	MODE	BLANK	BACKDROP
SIZE	MAG	VREG	DELAY
MOVE	DRAW	FCOLOR	JSWITCH
REMOVE	RDRAW	BCOLOR	SWITCH
PSG	TONE	ENVL	VOLUME
ADC	SPRITE	SPNAME	ENDEF
SPCOLOR	ASPRITE	SPDEF	PADEF
VPEEK	VPOKE	VPRINT	

Specify 5" or 8" softsector disk for TSC's FLEX or MICROWARE'S OS/9 system.

TERMS: CASH, VISA, MC, C.O.D.

5 MEG HARD DISK \$600⁰⁰

This is a new Shugart SA-10002 5.33 megabyte hard disk drive. Interfacing is a snap with the Western Digital WD1000-80 intelligent controller card (\$500). An example of the interface and software can be found in this month's issue. Power supply (\$150) is good for 2 drives and controller. Interfaces for CP/M, S-100, and STD BUS are also available.



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COMPLETE, READY-TO-GO SYSTEM INCLUDES:

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- Pete Bug keyboard monitor
- Optional Macs Bug CRT monitor
- Attractive cabinet
- Dual RS232 interface
- 32 bit parallel I/O
- Versabus compatibility
- The only system that provides for direct entry of 68000 machine code.



For information call (714) 566-3911
Computer System Associates

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ELEKTRA CABINET

Made of heavyweight 0.090" thick aluminum.
Interior Size: 18-1/2" wide by 21-7/8" deep x 6-3/4" high
Heavy duty A.C. line cord.
A.C. fuse holder
EMI filter
Fan with filter
Back panel has 10 cutouts for "D" type data connectors
Front panel has key on/off power switch, 2 illuminated push buttons (Reset and NMI/Abort), and 2 cutouts for 5-1/4" floppy drives.

Without power supply:	\$260.00
With 110v power supply, disk regulator board or two filter plates:	\$460.00
With 220v power supply, disk regulator board or two filter plates:	\$510.00

POWER SUPPLY

Higher quality linear power supply conservatively rated at 15a @ 8v.
3a @ 16v, 3a @ -16v
3 primary inputs to adjust for light, medium, and heavy loading
110v version: \$175.00 220v version: \$225.00

DISK REGULATOR BOARD with cables

Powers 2 5-1/4" floppy drives: \$50
Filter (fan): \$10.00

ELEKTRA CPU 8/9

Choice of 6802, 6808 or 6809 CPU
(6802 and 6808 are software compatible with the 6800 or the opecode level).

DEVICE	6809 ADDRESS	6802-6808 ADDRESS
3 2716 Eprams	Epram #3 F800-FFFF	F800-FFFF and E000-E7FF
	Epram #2 F000-F7FF	F000-F7FF
	Epram #1 E800-EFFF	E800-EFFF
1K Scratchpad RAM	E400-E7FF	A400-A7FF and A000-A3FF
MC14411 Baud Rate Generator producing baud rates of: Low Range 110, 150, 300, 600, 1200, 4800, and 9600 High Range 440, 800, 1200, 2400, 4800, 19200, and 38400	E210-E217	8200-8207

MC14411 Baud Rate Generator producing baud rates of:
Low Range 110, 150, 300, 600, 1200, 4800, and 9600
High Range 440, 800, 1200, 2400, 4800, 19200, and 38400

The board does not contain a DAT and does not support extended addressing.
The board supports DMA by either HALT or DLSAEQ when a 6809 CPU is used.
DMA to the devices on the CPU card is not supported.

The board will run any of the MIKBUG™ compatible monitors in the 6802-6808 mode and 3DUG-E, HUMBUG, and GMRBUG-99 in the 6809 mode. The ELECTRA CPU 8/9 will run any of the popular disk controller boards with the appropriate software. Special versions of OS-9™ L1 are available.

Bare board: \$50.00* Kit: \$225.00* Assembled: \$275.00

ELECTRA DPS Dual Port Serial Card

Fit the standard 30 pin SS-50 bus I/O slot
Can be configured for 4 addresses per port with the A port 2 addresses higher than the A port or for 16 addresses per port with the B port 4 addresses higher than the A port.

Each port is terminated at two 16 pin dip sockets, one socket configured for modem and the other socket configured for terminal or printer. RTS, CTS, DTR, DCD, DTR are appropriately implemented.

Each port has independent selection of baud rate.
Each port allows the interrupt request to be jumpers to the IRQ or FIRQ/NMI bus line.

Bare board: \$20.00* Kit: \$60.00* Assembled: \$80.00
Assembled cable (two required for each interface board): \$20.00 each

ELEKTRA DPP Dual Port Parallel Card

Fit the standard 30 pin SS-50 bus I/O slot
Can be configured for 4 addresses per port or 16 addresses per port (occupying the first four addresses of the I/O slot).

The direction of the TTL buffers can be controlled by either on board jumper connection or by a signal from the peripherals.
The interrupt request lines for each port may be individually jumpers to the IRQ or FIRQ/NMI bus line.

Bare board: \$20.00* Kit: \$60.00* Assembled: \$80.00
Assembled cable (two required for each interface board): \$20.00 each

ELEKTRA

COMPUTER PRODUCTS



ELEKTRA Motherboard

Heavyweight 0.125" thick, 18" long by 9" wide
11 memory (50 pin) slots, 4 or 8 slots may be cut off for shortening to 14" and 10" lengths respectively.

8 I/O (30 pin) slot
1" spacing between all memory and I/O slots
On board baud rate generator with high and low ranges providing jumper selectable rates for each of the five I/O baud rate lines.
Complete address decoding and selectability for the I/O ports.
Choice of 4, 8, or 16 addresses per I/O port.
Slow device circuitry permitting 4 MHz 30 pin disk controller to run with 2 MHz 50 pin CPU boards.

Extended addressing capability for meeting SS-50C bus specifications.

Bare board: \$80.00 Kit: \$240.00* Assembled: \$300.00*

*Gold square pin connectors instead of tin add \$80.00

ELEKTRA Chassis

Includes cabinet, power supply, disk regulator board and power cables, and assembled motherboard with gold connectors, totally installed. Ready to use with documentation.
\$485 Add \$50.00 for 220V.

GIMIX 16K memory board with control registers \$195.00

GIMIX #15 memory board with 32K static RAM \$295.00

WARNING

AAA Chicago Computer Center does not provide repair or diagnostic service for customer assembled kits. AAA Chicago Computer Center does warranty and maintain service for our assembled boards. The customer should carefully take into consideration the small difference separating our kit and assembled prices when making his choice of purchase.

We have introduced our line of computer equipment with the purpose of offering the highest quality of components possible at affordable prices. These products are intended for OEM applications where it is the responsibility of the purchaser to integrate these components with suitable memory, disk controller(s), drives, and software along with I/O terminal(s) to form working computer system(s).

AAA Chicago Computer Center
120 Chestnut Lane • Wheeling, IL 60090 • (312) 459-0450

Phone consultation available most weekdays from 4 PM to 6 PM

SMOOTH™ Software

SUPER MODEM PROGRAM

Transmit manually to distant computer

Transmit disk files (text) of any length to distant computer

Receive and save disk files (text) of any length on local disk system. If sending computer does not support an X-on/X-off protocol, then the received files are limited in size by the computer memory.

Tested to transmit and receive text at speeds up to 9600 baud. (CRT terminal must be capable of operating at a baud rate higher than the one the modem is operating at.)

Half duplex option in case distant computer doesn't echo.

Echo option so user can simulate a time sharing system. (Super Modem Program doesn't support auto-answer but the source is provided for those individuals who wish to adapt our program to their special needs.)

Replaces CR with CR/LF (user option) for those using time sharing systems that don't transmit LFs.

Shows disk file transmit (user option) based on character verification for use on time sharing systems to which disk files cannot be sent at speed suggested by the baud rate.

Please specify 6800 SSB, 6800 FLEX™, or 6809 FLEX™, 5" or 8"
Manual and disk with both source and object code \$75.00

STANDARD MODEM PROGRAM

Same as Super Modem Program above but without ECHO option, CR/LF for CR option, shows disk file transmit option, nor X-on/X-off option. Reception of disk files is limited to those small enough to completely fit in the receiving buffer.

Please specify 6800 SSB, 6800 FLEX™, or 6809 FLEX™, 5" or 8"
Manual with instructions, source listing, and flow chart, disk with both source and object code \$45.00

ALL IN ONE

Editor - Text Processor - Mailing Labels

Mailing Lists - Use any CRT terminal and printer

Supports Editing commands such as bottom, change, delete, find, insert (single line), input (multiple lines), list, read, overlay (with cursor editing, character deletion and insertion), overwrite (for selected data), print, restore, set, top, underline up and verify.

Supports Text Processing commands such as block copy, block move, centering, margin justification (wide and narrow), paging and tabbing.

Mailing Lists and Labels. Use the same mailing list data file (with protected areas) for both mailing labels and repeat letters. Repeat letters are personally addressed to each person or selected persons on the mailing list.

Block Processor File Handler found in any editor. Append one file to the end of another, or insert (merge) one file into another as designated by the line pointer. Print specified lines to your printer or to a disk file. Edit files larger than the text buffer. Does not produce output files when not desired. Delete disk files from the editor.

Printers commands. Control characters can be sent to the printer for format control either directly from the control terminal or by imbedding them in the text. The set command contains interface initialization and character output routines to support the SWTPC MP-C interface as well as the standard serial and parallel interfaces. Jumps are also provided to user supplied printer routines. User selects the port address 10 thru 7, A or B thereby minimizing the need for the user to install printer software routines. Editor can be initialized for either 4 or 16 addresses per port.

Editor allows switching to either the monitor or DOS and then reenter (Warm Start) without destroying previously prepared text in the buffer. The Restart command erases contents in the buffer without the user having to reload the Editor.

The Editor allows the user to toggle between full duplex (no echo) and half duplex (echo) as needed. It responds to commands in both upper and lower case and can be used to create assembler source code and Basic programs as well as text.

Specify 6800 SSB, 6800 FLEX™, 6809 FLEX™, 5" or 8"
Printed source listing is available for an additional \$5.00

Software by Technical Systems Consultants Inc.

Flex™ (Includes Editor and Assembler) 150.00

UniFLEX™ (Includes one year maintenance and update) 450.00

Editor 50.00

Assembler 50.00

68000 Cross Assembler on 6809 250.00

6809 Cross Assembler on 6800 100.00

Text Processor 75.00

Extended Basic 100.00

Basic Pico Computer (Specify standard or extended) 50.00

Pascal (Flex™) 200.00

Pascal (UniFLEX™) (Add \$75.00 for one year's maintenance and update) 225.00

Soft/Merge Package 75.00

6809 Flex™ Utilities 75.00

6800 Flex™ Utilities 100.00

Debug Package 75.00

Diagnostic Package 75.00

Software by Microware Systems Corp.

UPDATE SOURCE MANUAL OBJECT

OS-8" Level One Operating System 25.00 400.00 40.00 200.00

OS-8" Level Two Operating System 75.00 N/A 40.00 500.00

BASIC-OS™ 75.00 N/A 25.00 200.00

OS-8" Macro Text Editor 300.00 15.00 125.00

OS-8" Interactive Assembler 300.00 10.00 125.00

OS-9" Interactive Debugger (Disk version) 100.00 10.00 50.00

CIS Cobol Compiler 250.00 N/A 80.00 900.00

Pascal Compiler 100.00 N/A 40.00 400.00

Kit Assembler 595.00

SWTPC 6809 CPU Board 450.00

MP-A2 6800 CPU Board 150.00

MP-S2 Serial Interface (dual port) N/A 170.00

MP-LA Parallel Interface (dual port, limited quantity) 40.00 60.00

MP-L2 Parallel Interface (dual port) N/A 120.00

MP-R Single Voltage 2716 PROM Programmer N/A 114.50

MP-N Calculator Board 54.95 92.00

MP-T Interrupt Timer N/A 92.00

MP-BM 804064 Memory Board (limited quantity of 10) 150.00 275.00

S32 Universal Static Memory Board N/A 124.50

MP-09 6809 CPU Board N/A 295.00

89 Channel P.S. 6809 CPU, 8K RAM, One Serial Port N/A 799.00

Universal 6809 Bus Motherboard, 6800/6809 8/16 addressable per port

8.50 pin/8.30 pin slots, baud rate generator, 15 1/8" x 9 3/8" 85.00

ELEKTRA Motherboard (bare) 80.00

Connectors (10 pin, Tin-plated 5 microns for near gold quality)

Male with square cross section pins each .50

Female .50

Gold, Male square pins or female .50

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GIMIX™ and GHOST™ are registered trademarks of GIMIX Inc.

ELEKTRA™ SS50 Computer Products

ELEKTRA Dual drive cabinet for 5-1/4" drives with power supply, line cord, fuse, power switch, and power cable to drives.

ELEKTRA Dual drive cabinet, power supply, ps cable for 8" drives

Cabinet for dual 8" drives only

Power supply for dual 8" drives only

PS cables only (Specify brand and type of 8" drives)

1 500

350.00

250.00

120.00

30.00

Special Software

4K 6809 HUMBUG

75.00

4K 6800 HUMBUG (RAM needed at \$4000 and \$D000)

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2K 6800 HUMBUG (With cassette LOAD and PUNCH)

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2K 6800 HUMBUG (Extra commands instead of cassette software)

40.00

Other HUMBUG versions including video versions are available

Spellin Fix for Peter Stark

89.29

Dynamite Disassembler

60.00

SUPER STUTH Disassembler System

98.00

DISK DRIVES

30 day guaranteed, single and double density capability

\$250.00

5-1/4" single head, 40 tracks

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5-1/4" single head, 40 tracks, floppy

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MP1 - Service Manual

10.00

Siemens Manual

10.00

8" single head, 77 tracks

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8" single head, 77 tracks, Thin-Line

450.00

8" double head, 77 x 2 tracks

495.00

8" double head, 77 x 2 tracks, Thin-Line

525.00

Microline 8800 Calendar and Clock Board (assembled and tested)

105.00

Barcode connector and documentation only of above

35.00

(See review Feb 1980 68 Micro Journal)

Microline II

75.00

Data Mart 16K EPROM board (2708 chip)

30.00

Printers

Epson MX-80 (Centronics com shb8 parallel interface)

439.00

With Serial RS-232 interface option

add 75.00

Spare Print Head

39.95

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Optimus Technology, Inc. EP-2A-79 EPROM Programmer

169.00

(Personally一块板 extra for above programmer)

Optimus Technology, Inc. 30 pin parallel I/O Board for EP-2A-79

35.00

Software package for EP-2A-79 (Specify 6800 or 6809)

29.95

EP-2A-78 M-01 EPROM Programmer (User config'd and supplies power)

78.95

Smoke Signal Broadcast

Monitor on 2716 with manual (Specify Centronics or SWTPC)

75.00

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549.00

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LMB-1A Motherboard

399.00

SCB-69 6809 CPU Board

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M-24-X 24K Static Memory Board

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GIMIX

2 MHz 6809 Plus CPU, time of day clock, battery backup, 1K NMOS RAM

578.00

CMOS RAM substitution

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35.00

SWTPC compatible DAT

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Misting cycle detect card

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Disk Controllers (All have data separators and can be used with either single or double headed drives)

158.38

5" single density controller without 1771 chip

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5" single density controller complete

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588.68

GIMIX version of FLEX™ without Editor and Assembler

90.00

Double disk regulator card

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Ribbon cable for two 5 1/4" disk drives (short)

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Ribbon cable for two 8" disk drives (long)

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8" disk drive cabinet with power supply

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CMD WITH NMOS NO BAT BACKUP

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16K Static RAM Board with control registers

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32K Static RAM Board with 32K of RAM installed

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"discontinued, limited quantity available

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348.27

64K Static RAM Board with 32K of RAM installed

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64K Static RAM Board with 48K of RAM installed

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64K Static RAM Board with 56K of RAM installed

728.56

64K Static RAM Board with 64K of RAM installed

798.64

16 Socket EPROM/ROM/RAM Board

238.32

8K PROM Board (2708)

98.34

4K PPD 4K Prom Board and 2708 Prom Burner

198.00

I/O Boards

Single port 30 pin serial interface (Requires 1 cable set)

88.41

Dual port 30 pin serial interface (Requires 2 cable sets)

128.43

8 port 30 pin serial interface with baud rate generator

</div

GRANITE COMPUTER SYSTEMS

FLEX 9 DISC AVAILABILITY

Granite Computer software now available on 5.25 FLEX discs

THE DISASSEMBLER FAMILY

Source listings identical with TSC 6809 EDITER - User symbol tables - Local and global labels and expressions - Optional generation of occurrence numbered local (program) labels - Easy identification of data areas - FCB - FDE - FDC - Step disassembly one program or data statement at a time - Source tape or disc for TSC EDITER input - Run TSC ASSEMBLER with minimal modification - Problem codes flagged on output

Convenient menu driven options carry out tedious error prone disassembly operations - rapidly and accurately

JUST WHAT YOU NEED TO CONVERT THOSE 6800 & 6502 PROGRAMS!

6800 to 6809 DISASSEMBLER (see July '68' ad)	\$49.95
6502 to 6809 DISASSEMBLER (see August '68' ad)	\$49.95

COMPANION PROGRAM

6809 to 6809 DISASSEMBLER (see June '68' ad)	\$49.95
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LIMITED OFFER

Any two DISASSEMBLERS ordered together	\$74.95
All three DISASSEMBLERS ordered together	\$99.95

... Others in the series of super programs for the 6809 . .

EPROMMER - use with SWTPC MP-R Programmer \$39.95

TEXTWRITER - use with TSC EDITER - synergistic editing and processing package \$39.95

FILERMANAGER - use with JPC IC-3 high speed I/O board - comprehensive cassette oriented operating system - Cassette/Disc \$29.95 2716-1 EPROM \$39.95

All efficient - well documented and VERY FRIENDLY

Run on any 5550 6809 system with minimal change - Comprehensive Manuals - Object programs on KC cassette or 5.25 FLEX discs

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* Probably the most versatile EPROM PROGRAMMER available. Interfaces & software for EXORciser-II (fully addressable) and 8-30 bus systems.

* PROGRAMMER AND VIBRATOR 2500/2700, 2516/2716 (SINGLE AND TRI-VOLT TYPES) 2532, 2732, 2732A, 2564, 2764 AND THE 128K TMC2520 (16K x 8) -> -> -> WITHOUT ADDITIONAL 'PERSONALITY' MODULES <- <- <-

* PROGRAMMER extends out to your work area via 5' of twisted pair cable.

* EXTENSIVE COMMAND MENU.....MOVE BLOCKS OF DATA, READ, PROGRAM, AND VERIFY PROM's, EXAMINE/CHANGE BUFFER, FORMATTED DUMP OF BUFFER, FILL BUFFER WITH SPECIFIED BYTE, RETURN TO DOS OR MONITOR.

* Fully documented user's manual & mechanics & theory of operation.

* Software source file included on disk.....enables customizing.

* Completely finished PCB's w/solder resist & component overlay.

* 8-30 INTERFACE/PROGRAMMER/BASEPLATE (bare boards).....\$85.00
EXORciser INTERFACE/PROGRAMMER/BASEPLATE (bare boards).....\$95.00
HARD TO GET PARTS KIT (SPECIAL OIL SW, IMB, IN RES, trimmers).....\$17.00

* 8-30 INTERFACE/PROGRAMMER/BASEPLATE/CABLE (assembled).....\$295.00
EXORciser INTERFACE/PROGRAMMER/BASEPLATE/CABLE (assembled).....\$375.00

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PAYMENT BY: INT'L MONEY ORDER, BANK DRAFT, VISA OR MASTERCARD.
(PERSONAL CHECKS TAKE 4 - 6 WEEKS TO CLEAR!)

SPECIFY CPU (6800/6809), DISK SIZE (5/8"), AND OS8 (SSB/FLEX/OS8/OS-9)

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TELE: (0692) 405189
TELEX: 07340 SHARET B

WE ARE A STOCKING DISTRIBUTOR OF SSB, BIRIS, TSC AND MICROWARE.



MIDDLE-C

WW Small-C09 Release 2.0

All features of level 1.0, plus logical operators, assignment operators, conditional compilation, and an improved user interface. (Version 2.1 planned for OS-9.) Includes source to linkage editor (RLOAD 3.1) on separate disk. Run-time library source included. 48K recommended. Requires version 2 of TSC's assembler for PLEX9.

INTRODUCTORY PRICE:

For PLEX9 (includes RLOAD 3.1)	\$80.00
(If you already have RLOAD)	\$72.50
Inquire	

WW Small-C 2.0 PRICE GOES UP ON NOVEMBER FIRST!
SAVE \$20 BY ORDERING NOW

Purchase of level 2.0 includes FREE update to 2.1!

RLOAD 3.1 separately	\$17.50
Update from RLOAD 3.0	SASE

OTHER ITEMS OF INTEREST:

Chuck's Corner, by Dr. Charles Adams, published sporadically.

Eight issues (nominally one year)	\$ 2.00
With 8 #10 SASE's	
Without SASE's	\$ 7.50

The C Programming Language

by Kernighan and Ritchie
Software Tools, and
Software Tools in PASCAL
by Kernighan and Plauger
Books with any software order \$14.00 ea
ordered separately \$17.00

FUTURE PLANS:

A relocating macro assembler (to be included with release 2.2 of WW Small-C09), a screen-oriented editor (written in C), LISP (maybe), other applications in a public-domain C user's library, and a continuation of our unusually liberal update policy.

We are looking for software authors. Please inquire about our requirements and royalty schedule, before submitting software.

The Fine Print

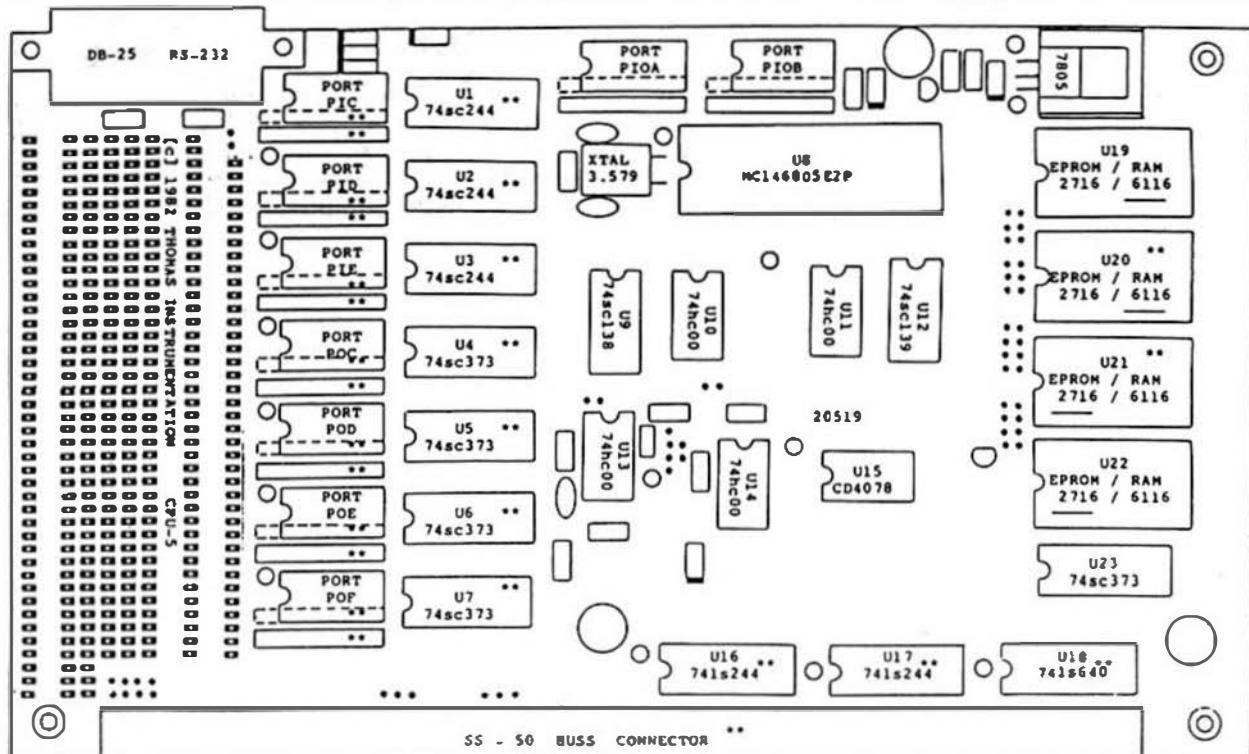
Unless otherwise specified, all software is supplied on PLEX-format, 35-track, single-sided 5" disk. Prices good until November 1st, 1982. Shipping via first class mail is already included, except add \$2.00 for orders shipped outside North America. Add \$35 for overnight parcel service to Canada, which still takes at least three days, or \$12 for "express mail" in US. Add \$2 handling for Visa/MC. Allow 3 weeks for non-certified check. Purchase order must be accompanied by payment. Texas residents: add \$0.25/disk. Release 2.1 of WW Small-C09 is scheduled for 1st quarter '83. The phone number is for our answering service. You may call to request further information to be mailed, or place a Visa/MC order 8:30-4:30 weekdays (CDT). For fastest response to technical questions, send #10 SASE.

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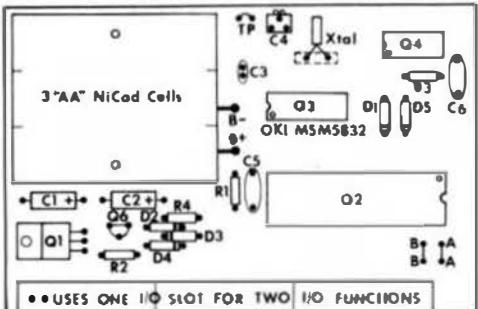
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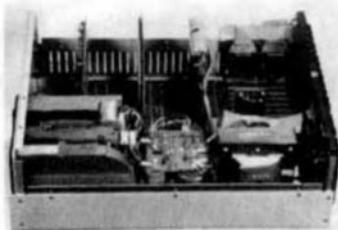
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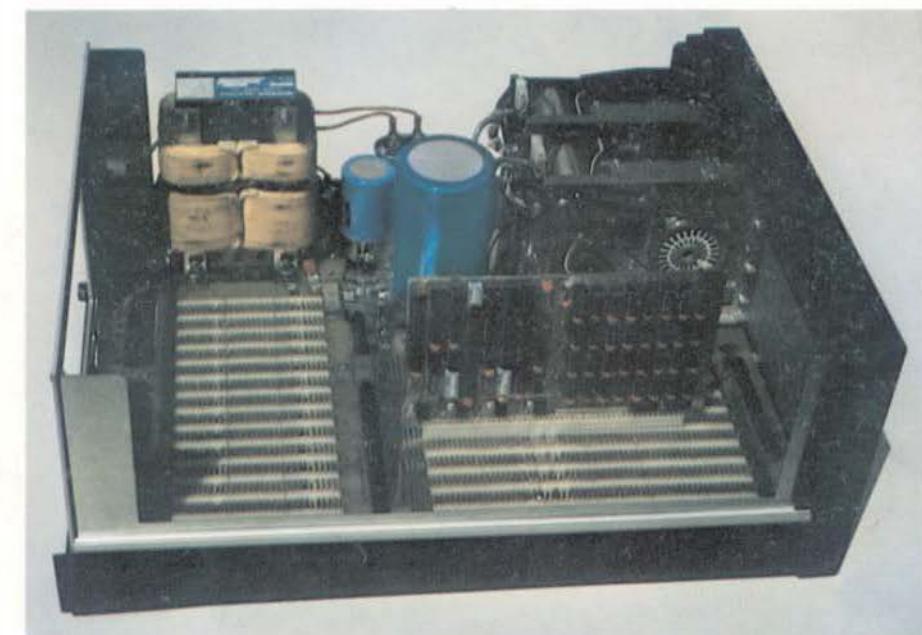
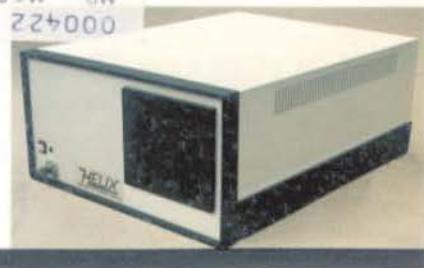
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160.0, 161.0, 162.0, 163.0, 164.0, 165.0, 166.0, 167.0, 168.0, 169.0, 170.0, 171.0, 172.0, 173.0, 174.0, 175.0, 176.0, 177.0, 178.0, 179.0, 180.0, 181.0, 182.0, 183.0, 184.0, 185.0, 186.0, 187.0, 188.0, 189.0, 190.0, 191.0, 192.0, 193.0, 194.0, 195.0, 196.0, 197.0, 198.0, 199.0, 200.0, 201.0, 202.0, 203.0, 204.0, 205.0, 206.0, 207.0, 208.0, 209.0, 210.0, 211.0, 212.0, 213.0, 214.0, 215.0, 216.0, 217.0, 218.0, 219.0, 220.0, 221.0, 222.0, 223.0, 224.0, 225.0, 226.0, 227.0, 228.0, 229.0, 230.0, 231.0, 232.0, 233.0, 234.0, 235.0, 236.0, 237.0, 238.0, 239.0, 240.0, 241.0, 242.0, 243.0, 244.0, 245.0, 246.0, 247.0, 248.0, 249.0, 250.0, 251.0, 252.0, 253.0, 254.0, 255.0, 256.0, 257.0, 258.0, 259.0, 260.0, 261.0, 262.0, 263.0, 264.0, 265.0, 266.0, 267.0, 268.0, 269.0, 270.0, 271.0, 272.0, 273.0, 274.0, 275.0, 276.0, 277.0, 278.0, 279.0, 280.0, 281.0, 282.0, 283.0, 284.0, 285.0, 286.0, 287.0, 288.0, 289.0, 290.0, 291.0, 292.0, 293.0, 294.0, 295.0, 296.0, 297.0, 298.0, 299.0, 300.0, 301.0, 302.0, 303.0, 304.0, 305.0, 306.0, 307.0, 308.0, 309.0, 310.0, 311.0, 312.0, 313.0, 314.0, 315.0, 316.0, 317.0, 318.0, 319.0, 320.0, 321.0, 322.0, 323.0, 324.0, 325.0, 326.0, 327.0, 328.0, 329.0, 330.0, 331.0, 332.0, 333.0, 334.0, 335.0, 336.0, 337.0, 338.0, 339.0, 340.0, 341.0, 342.0, 343.0, 344.0, 345.0, 346.0, 347.0, 348.0, 349.0, 350.0, 351.0, 352.0, 353.0, 354.0, 355.0, 356.0, 357.0, 358.0, 359.0, 360.0, 361.0, 362.0, 363.0, 364.0, 365.0, 366.0, 367.0, 368.0, 369.0, 370.0, 371.0, 372.0, 373.0, 374.0, 375.0, 376.0, 377.0, 378.0, 379.0, 380.0, 381.0, 382.0, 383.0, 384.0, 385.0, 386.0, 387.0, 388.0, 389.0, 390.0, 391.0, 392.0, 393.0, 394.0, 395.0, 396.0, 397.0, 398.0, 399.0, 400.0, 401.0, 402.0, 403.0, 404.0, 405.0, 406.0, 407.0, 408.0, 409.0, 410.0, 411.0, 412.0, 413.0, 414.0, 415.0, 416.0, 417.0, 418.0, 419.0, 420.0, 421.0, 422.0, 423.0, 424.0, 425.0, 426.0, 427.0, 428.0, 429.0, 430.0, 431.0, 432.0, 433.0, 434.0, 435.0, 436.0, 437.0, 438.0, 439.0, 440.0, 441.0, 442.0, 443.0, 444.0, 445.0, 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